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ORAL DISEASES

AND

SURGERY.

E. N. Moore,

A TREATISE

ON THE

DISEASES AND SURGERY

OF THE

MOUTH, JAWS

AND

ASSOCIATE PARTS.

BY

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PREFACE.

In the fulfillment of many promises made from time to time to his students and other friends, the author has prepared the following pages, as embodying the results of his observations and experiences during a somewhat extended practice in that branch of the profession to which it specially relates.

With the hope that the volume will be a useful text-book in assisting the student to prepare for the responsible duties of the profession, and a reliable guide to the intelligent practitioner, it is herewith offered to the attention both of those who are about to enter the field of their labors and of those who, though more familiar with the practical duties thereof, may desire to acquaint themselves more fully with the latest methods of practice.

That the work may prove a source of benefit to his fellow-beings is the highest hope concerning it of

THE AUTHOR.

ACKNOWLEDGMENT.

The first three hundred pages of this work were scarcely through the press when the author received the grateful encouragement of finding it adopted as a text-book by several of the oldest and most influential of the Dental Colleges of the United States; for such a manifestation of interest and confidence he would express his appreciation.

To S. S. White, Esq., who, with great generosity, placed at the command of the publishers all of his large collection of cuts illustrative of dental surgery, thanks are especially due, as this kindness has done much to enhance the value of the work.

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DISEASES OF THE MOUTH

AND

ASSOCIATE PARTS.

CHAPTER I.

SURGICAL ANATOMY OF THE MOUTH AND FACE.

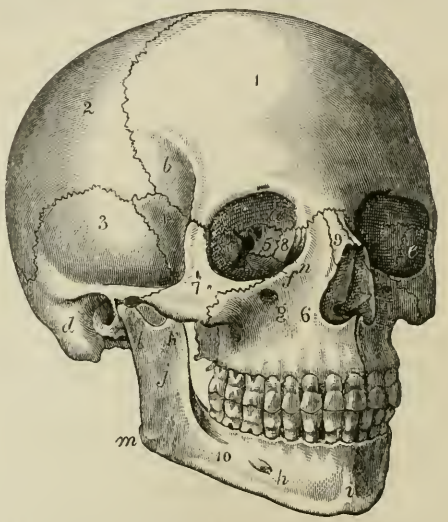
In a work on oral diseases and surgery, a source of ready and accurate reference to parts involved would seem to be an essential. With such view we map out, as accurately as the photograph and pencil may represent nature, all such parts as, surgically, we may have to deal with or comprehend. As—unless with the very experienced—it is always desirable to precede an operation on the living with a test performance on the dead, so with the student it is as desirable to found the comprehension of any pathological perversion on an understanding of normal characteristics.

In presenting these photographs of the various parts associated with oral surgery, we add the suggestion that the bones represented be procured and laid carefully away in the cabinet: the assistance of their silent expressions will be found invaluable. So far as the soft parts are concerned, one may either possess them in alcohol, or, what is even better, where it can conveniently be done, is to make it a point to yearly dissect them.

In Fig. 1 the lateral aspect of the face is seen to form, almost accurately, an oblong square. A modification on such a square, however, will be found to exist in the case of the child, where the ramus of the inferior maxillary bone is at a more obtuse angle with the body; also in the case of an adult with prominent os frontis. In either of these cases the lateral aspect is triangular.

Bounded circumferentially by the supraorbital ridge of the frontal bone, the nasal process of the superior maxillary, and the malar bones, we find a pyramidal cavity, the orbital, for the accommodation of the organ of sight. Looking at the natural bone, no less than seven pieces are observed entering into the composition of this cavity, some of which pieces in their relations closely affect some of the proceedings in oral surgery: for example, it will be seen that a large portion of the floor of this cavity is made up by a process, the orbital, which is a part of the superior maxilla; glancing at the natu-

FIG. 1.—FRONT AND LATERAL REGION OF THE SKULL.



THE SKULL, SEEN PARTLY IN FRONT AND ON THE RIGHT SIDE. 1, frontal bone; 2, parietal bone; 3, temporal bone, its squamous portion; 4, the sphenoid bone, temporal surface of its great wing; 5, ethmoid bone, its orbital surface; 6, superior maxillary bone; 7, malar bone; 8, lachrymal bone; 9, nasal bone; 10, inferior maxillary bone. *a*, orbital plate of the frontal bone; *b*, temporal surface; *c*, orbital surface of the great wing of the sphenoid bone; *d*, mastoid portion of the temporal bone; *e*, orbital surface of the malar bone; *f*, orbital plate of the superior maxillary bone; *g*, infraorbital foramen; *h*, mental foramen; *i*, symphysis; *j*, ramus; *k*, coronoid process; *l*, neck supporting the condyle; *m*, angle; *n*, lachrymo-nasal duct.

ral bone, it will be seen that this process constitutes as well the roof of the antral sinus; it will also be found to be a very thin plate; and capable of being easily elevated or depressed, according as any pressure might be brought upon it from below or above; constituting a source of support to the eye, it will also be seen that, where it is possible, it should be left undisturbed in operations demanding extensive interference with the bone of which it is a part. At the

inner inferior aspect of the cavity a groove will be observed, the lachrymal, being the entrance to a canal, the ductus ad nasum, carrying the tears from the orbit to the inferior meatus; the outer wall of this canal, which it is most important to maintain patulous, is made up by the inner face of the nasal process, another portion of the superior maxillary bone. Diseases of the sinus not unfrequently react on the eye, and to such an extent, that blindness of several months' standing has been cured by the extraction of a diseased tooth-root which had affected the antrum to its engorgement. Closure of the lachrymal canal is almost certain to occur if the nasal process becomes inflamed, and such inflammation I have frequently met with as the result of an odontocele.

Immediately below the inferior boundary of the orbit is seen a foramen, the infraorbital, for transmission of the infraorbital branches of the fifth nerve. Passing a bristle through this foramen, it is seen to emerge in the groove marked on the floor of the orbit,—the infraorbital groove in which the nerve lies in its passage outward. This groove and this canal are both in the maxillary bone, and are alike, with the ductus ad nasum, influenced by its diseases.

The canine fossa, seen back of and above the canine tooth, has, as its floor, a thin plate of bone, which is the external face of the antrum, and through which, if it should be found necessary, the cavity may be easily entered.

The tuberosity of the bone, occupied in part by the wisdom tooth, and marked for the attachment of the buccinator muscle, is a point of surgical interest,—it being not at all uncommon to have necrosis of this portion of the bone, the result of an ostitis, induced and kept up by an imprisoned dens sapientiæ. Standing, as is seen, at an angle, and tubercle-like, it is plainly evident that neither deformity nor harm would result from its separation as a sequestrum.

The alveolar processes are remarked to constitute quite a large part of both the superior and inferior maxillary bones. These processes, vascular and spongy, subjected to all irritations residing in diseased teeth, are, without doubt, more subject to take on pathological action than any other portion of the ossa corporæ. From the alveolo-dental periosteum spring epulic outgrowths of various signification. Sarcomatous degeneration finds here a favorite seat: simple and compound cysts are very familiar, degenerative ostitis is not uncommon, while abscess is found in almost every mouth. The mental foramen, seen upon the inferior maxilla, a little anterior to the middle of the body, is the outlet of a canal traversing the

center of the bone, and conducting beneath the teeth the dental artery and nerve. The size, general character, and inlet of this canal should be observed, as not unfrequently injuries to the artery require that the canal should be plugged, either as foramina are concerned, which exist beneath each tooth, or as the channel proper is interfered with in operations for tumors or sequestra.

Neuralgia of some of the peripheries of the inferior dental nerve makes necessary, occasionally, its section within the canal. To get at this nerve, requires either that we shall extract some tooth, and make the section from the base of the socket, or otherwise that a trephine shall be used from the outside. The easiest mode of performing such operations is to be observed, as relation is had to locations and character of bone.

The relationship of the teeth to their spongy processes is a matter which should receive close attention, the operation for their extraction being a very common one. These processes, if examined in a number of bones, will be found greatly to vary in character: in some being of such loose structure that the teeth are capable of the easiest separation; in other instances being so firm and unyielding that it is quite a matter of impossibility to make such extraction without more or less fracture.

The number and shape of the roots of the teeth are to be examined. A knowledge of their curves contributes much to an ease in their removal. Indeed, no one but the experienced can appreciate how much easier it is to remove the teeth with than without such knowledge.

The nasal bones, forming in their conjunction the nasal arch, should be examined in their relation to each other and to the neighboring pieces. Articulating with the perpendicular plate of the ethmoid, it has not unfrequently happened that the depression of this arch from a blow has carried the crista galli into the substance of the brain, and thus produced the most serious if not fatal consequences. The nasal bones are frequently the seat of syphilitic degeneration. Their destruction compels the falling in of the nasal arch, thus yielding the flattening of the bridge occasionally observed,—one of the most repulsive of deformities.

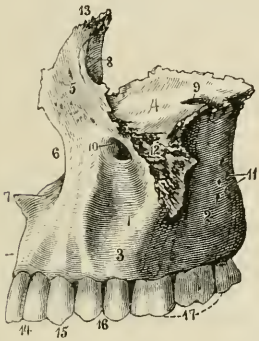
The incisive fossa, observed between the anterior nasal spine and central incisor teeth, frequently yields its floor to the ravages of necrosis. There would seem to be here less vital resistance than in other parts of the bone, as necrosis of a tooth is almost necessarily associated with necrosis of the superficial surface of its alveolus. This

plate is, however, quite thin, and its loss seldom seems of much consequence.

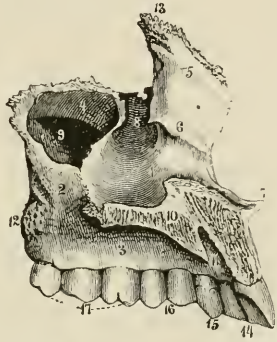
The position of a groove for the passage of the facial artery is to be noticed, as location and distance from the angle of the jaw are concerned,—the control of hemorrhage about the lips and cheeks being here secured through simple pressure on the artery as it passes over the bone.

With such general observation of the surgical features of the bones in their conjunction, we pass to a more accurate comprehension, by examining the pieces in their separate capacities.

FIGS. 2 AND 3.—SUPERIOR MAXILLARY BONE.



SUPERIOR MAXILLARY BONE OF THE LEFT SIDE, outer view. 1, body; 2, tuberosity; 3, alveolar border; 4, orbital plate; 5, nasal process; 6, nasal notch; 7, nasal spine; 8, lachrymal groove; 9, entrance of the infraorbital canal; 10, infraorbital foramen; 11, orifices of the posterior dental canals; 12, malar process; 13, articulation for the internal angular process of the frontal bone; 14, incisor teeth; 15, canine tooth; 16, premolar teeth; 17, large molar teeth.



SUPERIOR MAXILLARY BONE OF THE LEFT SIDE, inner view. 1, nasal surface of the body; 2, surface for the palate bone; 3, alveolar border; 4, orbital plate; 5, nasal process; 6, ridge for the articulation of the turbinated bone; 7, nasal spine; 8, groove contributing to form the lachrymo-nasal duct; 9, maxillary sinus; 10, palate plate, its articulating border for the right maxillary bone; 11, incisive foramen continuous with the naso-palatine canals; 12, tuberosity; 13, articular extremity for the internal angular process of the frontal bone; 14, incisor teeth; 15, canine tooth; 16, premolar teeth; 17, large molar teeth.

Glancing hastily at the superior maxillary bone, it seems like a quadrilateral, more or less irregular, solid piece. Looking at it closely, and from the surgical stand-point, we find it to consist of a series of processes, so grouped together as to form, or rather inclose, a cavity so large that the apparently solid body is found to be simply a shell. This cavity of the shell is called the maxillary sinus, or the antrum of Highmore. It is a very irregular cavity,

differing, indeed, in shape in almost every bone; generally, however, being found as a single cave, but not unfrequently divided into two or more by septi of bone vertically placed. How far, in the mean of cases, the cave is found to run forward and how far backward, what in the mean of cases is its relation to the roots of the various teeth, which of its boundaries are the thinnest, are matters worthy of being most attentively studied, because of their very practical signification, and which study can only be made by an observation of many bones. Abscesses of the roots of teeth frequently void themselves into this cavity: we are to understand how and why, anatomically, such accidents occur. Engorgements of the cavity, puruloid or dropsical, bulge outward some part or other of the circumferential walls, perhaps throwing the eye upon the cheek, projecting the canine fossæ, or making a tumor on the palatine aspect of the mouth: we are to understand why such bulging, from a common cause, is found so variously situated, or why, indeed, such accumulations exist at all.

If we make such a section of the superior maxillary bone as to expose the antral cavity, we shall find that in many cases, not indeed in all, its floor is studded with little hills; break into one of these elevations, and you will find that it is a very thin crust, concealing the root of some tooth or teeth. In infrequent cases, a root or roots will be found projecting into the cavity, entirely uncovered, save with the membrane which had existence in the living part. Such a view explains very satisfactorily dental abscess within this sinus.

The processes which, in their conjunction, make up the bone, are four in number: the alveolar, the palatine, the nasal, and the malar.

The alveolar process, wedged in between the malar and palatine, constitutes perhaps the greatest bulk of the bone. Looked at from below, it is found to be excavated into cavities or pits, corresponding with the character and number of the roots of the teeth; these pits are termed alveoli, and, in the recent bone, are found lined with periosteal tissue, which tissue is reflected around the roots of the teeth, forming the immediate bond of connection. In some bones, the structure making up this process is exceedingly loose and spongy; in others it is condensed, and cortical-like. After the loss of the teeth, this process is removed through absorption; hence the approximation, in old people, of the chin and nose. Fractures of this process, the result of falls, blows, or attempts at tooth extraction, are quite common.

The tuberosity of the bone may be esteemed as the posterior extremity of the alveolar process, being, indeed, not unfrequently

excavated for the wisdom tooth. This tubercle, as implied in its name, is simply a bulb of bone; it is quite vascular, however, and its relation to the posterior tooth subjects it to sources of irritation, which not unfrequently results in its inflammation and death.

The malar process, seen projecting from the middle of the bone, is a rough, serrated facet for articulation with the malar or cheek bone. This process, in front, is seen to be somewhat concave; behind it has a similar curvature, and forms part of a fossa known as the zygomatic. The chief point of interest connected with it, however, lies in the character of the suture which unites the maxillary with the malar bone, this being the place of separation in amputation of the maxillary.

The nasal process, well represented in the drawing, but better studied and understood from the bone, is observed standing above the orbital surface. Rising from the anterior facial surface of the bone, it continues somewhat triangularly upward, until it ends in an irregular semi-cell-like extremity. These semi-cells articulate with the ethmoid, closing in, and completing the anterior ethmoidal cells, also with the frontal bone, completing the lower boundary of the sinus of this bone. Lined in the recent state with the Schneiderian membrane, which membrane is continued into the cells of the ethmoid and frontal bones, a moment's reflection recognizes the meaning of that sense of fullness so common about the anterior base of the cranium, when inflammation and congestion exist in the nasal canals. Externally, the face of the process is concave, thus assisting in carrying out the natural curve of the lateral aspect of the nose; numerous foramina are also observed on this face, for the passage of vessels. The tendo oculi has its attachment on this surface, while near, on the same plane, is a line giving origin to the levator labii superior alæque nasi and orbicularis palpebrarum muscles. Anteriorly, the border of the process is thin, and serrated for articulation with the nasal bone. Posteriorly, it is thick, and hollowed into a groove for the lodgment of the lachrymal sac and duct. When in position, in the articulated skull, this groove is converted into a canal by annexation with the lachrymal bone; the canal, traced downward, is found to have somewhat an hour-glass shape, being considerably contracted in the center, and finally terminating at the inferior meatus in a bell-shaped opening. A little tubercle, the lachrymal, is seen where the anterior lip of the groove joins the orbital surface; this is a guide, directing the bistoury of the surgeon into the canal, when operations for its stricture are demanded.

The orbital surface of the bone, seen before in its articulative

position, is here observed separate; falling at direct right angle from the facial aspect of the bone, it is observed by this relation to form a large part of the floor of the orbital cavity; while looked at from the cave of Highmore, it is seen to form as well the roof of this vault. When broken, or held against the light, it is found to be almost a scale in thinness. The infraorbital ridge is simply the rim made by the bending downward of this orbital surface. Running along the free edge is observed three distinct articular faces: the outer for the palate bone, the two inner for the orbital or plane plate of the ethmoid and lachrymal bones. Below the rim, or infraorbital border, is seen the orbital foramen. Passing a bristle into this opening, we find it directed to the groove on the orbital face, the intraorbital. Passing the bristle now from the groove toward the foramen, we find it may take some other track, and not appear at the opening. Searching for an explanation, we find the groove, soon after entering beneath the ridge, to divide into two canals, one of which passes to the face, as observed, the other enters the antrum, and transmits across this cavity the nerves and vessels designed for the nutrition of the anterior teeth.

The osseous boundary of the nose is seen in this drawing to advantage. It is a complete curve, and gives attachment by its continuous crest, or edge, to the cartilaginous wings.

The zygomatic surface, seen back of the malar process, enters into the formation of the fossa of that name. It is to a degree convex, and more or less rough. Dotting its surface are observed a number of foramina; these are entrances to canals, the posterior dental, and transmit vessels to the posterior teeth, to all situated back of the canines. At the lower part of this surface, to the nasal aspect of the tuberosity, is a groove destined to be converted into a canal through an articulation with the palate bone, the posterior dental groove. This groove or canal transmits vessels to the palatine face of the bone, and is seen to terminate on the under side of the tuberosity.

The muscles of expression, to which the outer surface of the bone gives origin, are numerous. From the second bicuspid, back to the tuberosity, is a rough line for the trumpeters, or buccinator (a similar line existing on the inferior maxilla). Above this first line, and below the malar process, certain fibers of the masseter are attached. Above the canine fossa is the origin of the levator anguli oris; while without this, toward the concavity of the nose, is the line for the compressor naris. In the incisive or myrtiform fossa is seen the origin of the depressor alæ nasi.

Turning now toward us the inner face of the bone, we see the fourth process, the palatine. This process starts out from the middle of the bone, and divides it into two unequal parts. Like the orbital plate, it is at right angles with the body, and, when the piece is articulated, is seen to divide the nose from the mouth, constituting the floor of the first cavity and the roof of the second. Posteriorly, it is quite thin, and articulates with the palatine process of the palate bone. Running forward, it grows thicker and heavier, and ends in the anterior nasal spine. Viewed above, its surface is slightly concave, to form the floor of the nares. Externally, it becomes merged into the body of the bone; internally or mesially, it raises itself into a ridge, which is the one side of a groove receiving into articulation the vomer. A bristle passed through an opening in the process shows the position of a canal, the anterior palatine, transmitting vessels of that name, which find entrance into the oral cavity through the incisive foramen seen just back of the center tooth. A nerve, the naso-palatine, having considerable surgical signification, enters the mouth at the orifice of this canal; but is not transmitted by it, having a canal of its own in the intermaxillary suture. The three marked points of surgical interest in this process are—first, the fact of its forming the boundary between the mouth and nose, a break in its continuity, and which, unfortunately, is a not infrequent accident, throwing these two cavities into one; second, the nature and relation of suture with the palatine process of palate bone, this being the line of separation in amputation; third, the position of entrance of naso-palatine nerve, paralysis of the parts supplied by this nerve being a frequent result of illy applied pieces of dental apparatus. To these three might be added a fourth, the position of the artery occupying the posterior palatine canal, an artery which is sometimes of considerable size, and which might easily be cut by the slip of a lancet applied to the gum of a wisdom tooth, or in the act of dividing the tendon of the flexor palati where it curves around the hamular process.

The other features observable on this aspect of the bone are without special surgical interest. Above the inferior meatus, which is the space between the floor of the nares and the inferior turbinated bone, is seen the crest of attachment for this scroll. Still higher, on the nasal process, the crests for union with the superior and middle scrolls. The middle meatus, into which opens the antrum, is observed to be quite a large space, particularly when compared with the superior meatus, which is the slit lying between the upper

and middle crests. The opening of the antrum, seen in the back part of the middle meatus, is here portrayed of a natural size—that is, natural to the disarticulated bone. It will be remembered, however, that it is filled in by other bones, which, in the articulated skull, reduce the opening to an outlet not larger than an ordinary probe; the bones closing in this cavity are the ethmoid, palate, and inferior turbinated. (See descriptions of these bones.)

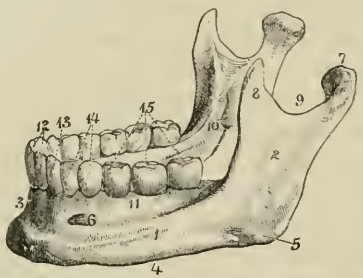
The superior maxillary bone articulates with nine others: by its nasal crest with the frontal, ethmoid, lachrymal, and nasal; by its malar process with the malar; at the intermaxillary suture with the opposite maxilla; by its palatine process with the palate and vomer, and at the lower of the lateral crests with the inferior turbinated bone.

Nine muscles have their origin from this bone: orbicularis palpebrarum, inferior oblique of orbit, the elevator of superior lip and wing of nose, the proper elevator of lip, the angular elevator, compressor naris, depressor of ala, masseter, and buccinator.

INFERIOR MAXILLARY BONE.

The inferior maxillary bone, the largest and strongest bone of the face, consists of a body, horseshoe in shape, and two rami, joined to the body at right angles. The body, which is the anterior portion, is surmounted by a process of more or less spongy bone, excavated for the reception of the teeth; the basement portion, or

FIG. 4.—INFERIOR MAXILLARY BONE.



1, body; 2, ramus; 3, symphysis; 4, base; 5, angle; 6, mental foramen; 7, condyle; 8, coronoid process; 9, semilunar notch; 10, inferior dental foramen, the entrance of the corresponding canal; 11, alveolar border; 12, incisor teeth; 13, canine tooth; 14, premolars; 15, large molars.

that portion beneath the spongy series of cells, or alveolar process, is made up of very dense structure, and so hard and resisting as to be able to withstand very considerable blows. The rami, curved

and angular at the base, terminate above in two processes: the condyloid, for articulation with the glenoid cavity in the temporal bone, and the coronoid, for the attachment of the temporal muscle. The angle of relation of the perpendicular to the horizontal portion of the bone varies with different ages. In early infancy it is very obtuse; indeed, the two portions are nearly on the same plane. In adult life a right-angled relation is obtained, and this changes again to the obtuse as age advances, and the teeth fall out. Taking advantage of a knowledge of these changes, the surgeon is enabled to correct, in young life, the great deformity of an unduly projecting lower jaw.

Looking at the external face of the body, the attention is first attracted by a prominent foramen situated beneath the bicuspid teeth. This foramen is called the mental, and from it passes out, to be distributed to the lip and gum, the inferior dental artery and nerve; the situation of the foramen represents the line of relation between the hard and spongy portions. It is at this opening that section of the nerve is occasionally made for severe and resisting mental neuralgia. A bristle passed into this foramen, looking backward, is directed along a canal at the base of the teeth, and emerges at an opening situated on the inner face of the ramus. Passed forward, it enters a smaller canal, which continues under the central teeth, carrying to these organs branches of the nerve and artery. An oblique line—the external oblique line, as it is called—fairly divides the surface of the body into two triangles. This line is for the attachment of muscles, and accommodates the buccinator, in part, the depressor anguli oris, and the depressor labii inferioris. In old persons, after the loss of the teeth, and absorption of the alveolar process, it is found to run almost along the upper surface. The center line, called the symphysis, represents the position or division existing in the young bone, union of the two halves not occurring until about the end of the first year. The levator menti muscle has its origin from the fossa at the side of this line. The mental process, the tubercle at the base of the symphysis, is only a thickening or an hypertrophy, for the greater strength of the part. Viewed from above downward, the body of the lower jaw is concave; from behind forward it is convex.

The external face of the ramus or perpendicular portion of the bone exhibits a quadrilateral aspect, broken above by a notch, the sigmoid, which separates the two projecting processes. The anterior of these processes is a thin, flattened, triangular eminence,

giving attachment to the masseter and temporal muscles. The posterior eminence, the condyloid process, is an oval projection, convex and smooth, with its face covered with articular cartilage, and having its greatest width from side to side. The process articulates the bone with the occipital, and is occasionally the seat of fracture and luxation.

The internal face of the bone presents the same general view with the external.

A ridge, the mylo-hyoid, divides the body by its oblique line into two parts. To this ridge is attached, or rather from it has origin, a muscle of the same name. This muscle, with its fellow of the opposite side, forms the floor of the mouth, so that looking at the line one sees exactly how much of the bone is within and how much without the oral cavity. Just below the line, about midway of the body of the bone, is seen a fossa or depression, the submaxillary, for the accommodation of the gland of that name. The mesial line or symphysis presents on either side two tubercles, called the genial tubercles, to which are attached the genio-hyoglossi and the genio-hyoideus muscles. Outside of these tubercles, on either side, are two fossæ for the lodgment of the sublingual glands; these fossæ are called after the name of the glands. It will be observed that these fossæ lying above the ridge, the lingual glands must be within the mouth, while the submaxillary fossa being below it, these glands are without the cavity. One most important feature to remark is the relation of the anterior border of the vertical portion of the bone to the molar teeth. It not unfrequently happens that the border so nearly approaches the second molar that there is no room left for the eruption of the third; the most formidable inflammations sometimes result from such a cause, the crown of the tooth being held down under the ramus. Extraction of the adjoining anterior tooth, it will be seen, would allow the confined one to fall forward.

A marked feature of difference between the internal and external face of the ramus is the existence in the former of a large foramen, the inferior dental, for transmission into the canal alluded to, as passing beneath the teeth, of the inferior maxillary vessels and nerve. The position of this foramen is to be appreciated by accurate measurement, as just within it is performed the operation of section of the nerve. A groove, the mylo-hyoid, transmits to the muscles of the ridge an artery, which comes from the inferior maxillary just as it is about to enter its canal. Attached to the border and internal face of the coronoid process is the tendinous expansion of the temporal

muscle, while to the face of the condyloid is attached the pterygoideus externus, the internal pterygoid being attached to the angle. The semilunar depression, separating the two condyles, the sigmoid notch, is crossed by the masseteric artery and nerve, while in its immediate proximity is the internal carotid and internal maxillary arteries.

FIGS. 5 AND 6.—PALATE BONE.

POSTERIOR VIEW OF THE RIGHT PALATE BONE. 1, palate plate; 2, nasal plate; 3, pyramidal process; 4, articular border for the left palate bone; 5, palate spine; 6, ridge for junction with the turbinated bone; 7, spheno-palatine notch, between 8, the orbital, and 9, the sphenoidal process; 10, groove for the internal pterygoid process of the sphenoid bone; 11, position of the posterior palatine foramen.

EXTERIOR VIEW OF THE RIGHT PALATE BONE. 1, rough surface articulating with the superior maxillary bone, and diminishing the aperture of the maxillary sinus; 2, posterior palatine canal, completed by the tuberosity of the superior maxillary bone; 3, spheno-palatine notch; 4, 5, 6, orbital process; 4, surface directed toward the pterygo-maxillary fossa; 5, orbital surface; 6, maxillary border; 7, sphenoidal process; 8, pyramidal process.

The palate bone in position is seen to form the back part of the hard palate, a portion of the floor and side of the nares, and a part of the orbital cavity. It also enters into the formation of three fossæ: the zygomatic, spheno-maxillary, and pterygoid. Like the inferior maxillary, the bone consists of two portions: one horizontal, the other at right angles with it, or vertical. The horizontal portion is irregularly quadrilateral, presenting two surfaces and four borders: the upper of the two surfaces is concave, and forms the back part of the floor of the nares; the lower or under surface is also concave, and forms the back of the hard palate. The suture of connection with the maxillary bone is always plainly seen, and is called the palato-maxillary suture.

In glancing at the bone from its posterior view, it is seen very markedly to resemble the letter L. Studying it in detail, we may remark, first, the spine, situated at the base of the interpalatal suture, and which gives attachment to the motores uvulæ muscles; passing toward the vertical portion, the concave character of both

nasal and palatine faces is observed, the former much more marked than the latter. This nasal concavity is seen to end at a crest or ridge on the vertical portion. This ridge is the most posterior articular surface of the inferior turbinated bone, and the space below it a part of the inferior meatus. The base of the vertical portion is pyramidal, and ends in a process called the pterygoid or tuberosity, its articulation being with the pterygoid plates of the sphenoid. At the back part of this process are seen the three grooves: the middle one, wide and smooth, forms part of the pterygoid fossa, and gives attachment to the internal pterygoid muscle; the two lateral are rough and uneven, and articulate with the anterior border of each pterygoid plate.

Passing upward, the prominent feature is the sphenoid process. This is a comparatively thin plate, made up of an articular and non-articular surface, a groove and a notch. The articular surface associates the plate with the sphenoid bone; the non-articular enters into the composition of the zygomatic fossa. The groove contributes to the formation of the pterygo-palatine canal; and the notch, closed in above by the orbital process, forms the greater part of the spheno-palatine foramen. This process also contributes, by one of its surfaces, to the lateral wall of the nasal fossa.

The orbital process, resting on the sphenoidal, is composed of five plates, or surfaces, inclosing a cavity. Of these processes, three are articular, two free surfaces. The articular are the maxillary, the sphenoidal, and the ethmoidal, associating the process with these bones. The free surfaces are the orbital, forming a small part of the orbital cavity, and the zygomatic surface entering into the composition of this fossa.

Looking on the inner face of the bone, we remark, first, the articular process. This process or surface associates the bone with its fellow of the opposite side; above, it forms, with its neighboring piece, a ridge receiving the vomer. The body of this face seems made up of two great concavities, with a separating ridge. This ridge articulates the inferior turbinated bone; the concavity above is part of the middle meatus; that below, part of the inferior meatus; the ridge or crest is called the inferior turbinated crest. A second crest, situated at the upper boundary of the middle meatus, articulates the lower scroll of the ethmoid, or the middle turbinated bone. This is called the superior turbinated crest. Just below it is seen the now perfected notch in the sphenoidal process, the spheno-palatine foramen, for the transmission of the vessels and nerve of

that name. Above the superior crest is seen the posterior part of the superior meatus, a horizontal groove, bounded above by the lower border of the ethmoidal face of the orbital process.

The orbital process, seen from this side, presents three surfaces: the maxillary in front, the orbital above, and the ethmoidal internally.

The lateral surfaces of the bone are almost entirely articular. That looking front associates in its full length with the superior maxillary bone; that looking back, with the sphenoid, through its pterygoid processes. This very full articulation with these two bones leads us to speak of the palate bone as being wedged between them, and being supported by them.

The articulations of the palate bone are with seven others: the superior maxillary, the inferior and superior turbinated, the vomer, the sphenoid, the ethmoid, and its fellow of the opposite side.

The muscles attached to it are the tensor palati, the motor uvula, the internal and external pterygoid.

THE VOMER.

The vomer, plowshare-shaped, constitutes a portion of the septum narum. It articulates below with the interpalatine suture of the superior maxillæ and palate bones; above, with the perpendicular plate of the ethmoid; by its base with the laminæ and ros-

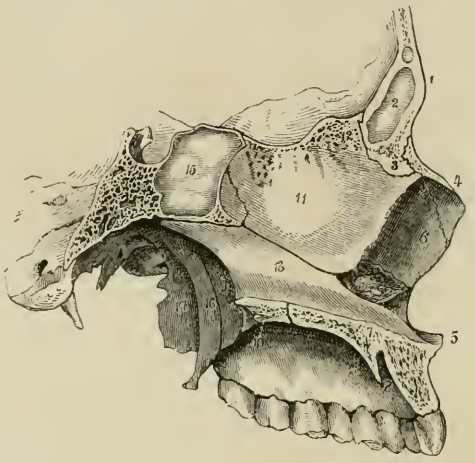
FIG. 7.—THE VOMER.

VIEW OF LEFT SIDE. 1, 1, broad groove receiving the rostrum of the sphenoid bone; 2, 2, inferior border articulating with the palate plates of the superior maxillary and palate bones; 3, posterior border, the dividing line of the posterior nares; 4, 4, groove border receiving a narrow slip of cartilage, situated between the vomer and the nasal plate of the ethmoid bone; 5, 5, border for the cartilaginous septum of the nose; 6, 6, nasal surface.

trum of the sphenoid bone; in front it associates with the triangular cartilage; posteriorly it is seen separating the nares. The naso-palatine groove, seen running from the base, forward and downward, toward the triangular cartilage, transmits the naso-palatine nerve to the interpalatine canal.

Occasionally it is the case that the vomer is found markedly bent to one side or the other, and this to such an extent, frequently, as to completely obliterate one of the nares, requiring an operation for its relief. The vomer is also subject to syphilitic attacks, and frequently breaks down, allowing the arch of the nose to fall in.

FIG. 8.—ARTICULAR RELATIONS OF VOMER.



VERTICAL SECTION OF THE FACE, exhibiting the osseous nasal septum. 1, frontal bone; 2, frontal sinus; 3, nasal spine of the frontal bone; 4, nasal bone; 5, nasal spine of the superior maxillary bone; 6, nasal process of the same bone; 7, border of the palate plate of the same; 8, incisive foramen; 9, left posterior naris; 10, palate plate of the palate bone; 11, nasal plate of the ethmoid bone; 12, ethmoidal crest; 13, vomer; 14, left turbinated bone; 15, sphenoidal sinus; 16, internal pterygoid process; 17, external pterygoid process.

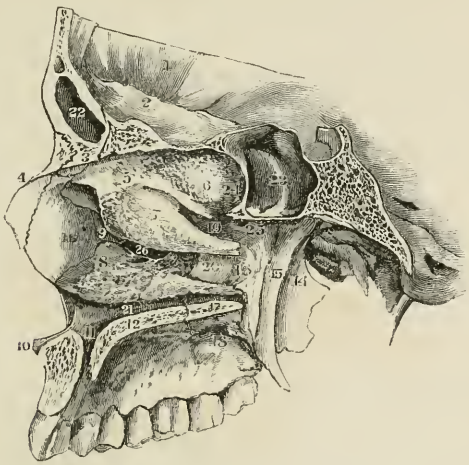
The articulation is seen to be with six bones: the two superior maxillary, two palate, the sphenoid, and ethmoid; also with the cartilaginous septum, not shown in the view, but occupying the triangular break.

Running across each lateral face of the nasal cavities are three scrolls, known as the turbinated bones. Of these scrolls, the two upper are simply processes, or portions of the ethmoid bone; the lower is a distinct piece, and is called the inferior turbinated bone.

Observing the position of these scrolls, it is remarked that each curves over a portion of the sides of the nares. The spaces thus inclosed are called the meatuses. The lower or inferior of these cavities is bounded below by the floor of the nares; above by the inferior turbinated bone. An opening seen about its middle is the outlet of

the lachrymal canal. The middle meatus is the space bounded below by the upper surface of the inferior scroll; above by the lower surface of the middle scroll. A foramen seen in this meatus is the outlet

Fig. 9.—Position and Relations of Turbinated Bones.



View of the outer wall of the right nasal fossa. 1, frontal bone; 2, its orbital plate; 3, its nasal spine; 4, nasal bone; 5, ethmoid bone; 6, its upper turbinated process; 7, its lower turbinated process; 8, turbinated bone; 9, process of the lachrymal bone, within the position of which is the lachrymo-nasal duct; 10, nasal spine of the superior maxillary bone; 11, naso-palatine canal; 12, palate plate of the superior maxillary bone; 13, nasal process of the latter; 14, external pterygoid process; 15, internal pterygoid process; 16, nasal plate of the palate bone; 17, its palate plate; 18, posterior palatine foramen; 19, superior meatus of the nose; 20, middle meatus; 21, inferior meatus; 22, frontal sinus; 23, sphenoidal sinus; 24, its communication with the upper back part of the nose; 25, spheno-palatine foramen; 26, orifice of the maxillary sinus.

of the antrum. The superior meatus is the slit seen between the two upper scrolls.

The distinct or inferior turbinated bone is a thin, spongy scroll, having a base of attachment the whole length of the lower crest seen on the nasal surfaces of the maxillary and palate bones; the opposite or inferior edge is free, and lies in the middle of the inferior meatus. Viewed from its inner surface, the bone presents a most irregular appearance, being perforated with numerous apertures, sulci, and grooves, for the accommodation of arteries and veins. Two processes, the lachrymal and ethmoid, are seen to break the regularity of the upper convexity. The anterior, the lachrymal, articulates with the inferior angle of the lachrymal bone, and with the nasal crest of the maxillary bone, thus assisting in forming the

lachrymal canal. The posterior, the ethmoidal, articulates with the descending unciform process of the ethmoid bone. Turning here the bone, we see a third process, or division, as it were, made in the ethmoidal. This process is called the maxillary. It curves downward within the inferior meatus, assisting in filling up the antral orifice, and, in its attachment, steadies the bone firmly on the side of the nares. Externally, the general appearance of the bone is concave; internally, or looking toward the septum narum, it is convex. If the external surface was convex, and the processes absent, the bone might very well be likened in shape to the Indian stone arrow-head.

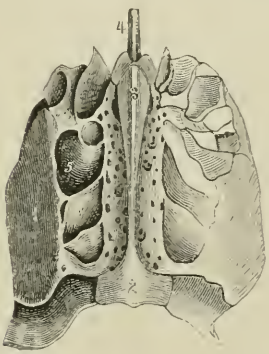
The turbinated bone is very subject to specific inflammation, and which, without great care, is apt to end in its death.

The bone articulates with four others: the ethmoid, the lachrymal, the maxillary, and palate. No muscles are attached to it.

THE ETHMOID BONE.

A horizontal cribriform plate of bone, with a crest along its middle; a perpendicular plate dropping down from the center of this first piece; two little oblong square boxes, hung on either side of the perpendicular plate, leaving the space of a narrow slit between the boxes on either side and the plate, and we have the complete idea of the ethmoid bone. Looking at the bone from above, we remark, first, the crest—crista galli it is called—giving attachment to the falx cerebri. On either side of this crest is seen a depression perforated with a number of foramina. These depressions lodge the olfactory bulbs, and the foramina transmit to the nose the olfactory filaments, the three sets having corresponding foramina. A slit seen at the side of the crista galli transmits the nasal branch of the ophthalmic nerve. Looked at anteriorly, the crest is seen to terminate in two little

FIG. 10.—ETHMOID BONE—GENERAL VIEW.



1, orbital surface of the lateral mass; 2, posterior extremity of the cribriform plate, which unites the lateral masses, and is depressed and perforated with numerous foramina on each side of the ethmoidal crest 3; the two oblique processes in advance of the latter are the ethmoidal wings; 4, anterior extremity of the nasal plate; 5, the ethmoidal sinuses.

horns or wings; these articulate with depressions in the os frontis, and occasionally in a manner so imperfect as to leave an opening or foramen. When existing, this foramen accommodates a nasal vein, which passes upward, to terminate in the longitudinal sinus; the rupture of this vein, discharging the sinus, has saved many lives in attacks of congestion.

The perpendicular plate, exhibited by the removal of one of the lateral masses, is simply a thin plate of bone. This, descending in the middle line of the nose, assists the vomer in separating this cavity into two lateral halves. In front, it is received into the groove between the two nasal bones; below, it looks downward and forward, and receives the triangular cartilage; back of this it articulates with the vomer, and still farther back with the sphenoid.

On each side of the plate are seen numerous grooves leading from the foramina in the horizontal or cribriform plate; these are channels receiving and shielding the inner olfactory filaments.

The boxes or lateral masses are very loose, and areolar-like, and constitute a series of cells. Disarticulated, many of these cells appear broken; but when associated with the ethmoidal fissure of the frontal bone, with the sphenoidal scrolls, with the orbital processes of the palate bones, and the nasal processes of the maxillary and palate bones, the cells are found to be completed. The union of these cells, more or less directly, with the common nares, and the fact that they are all lined by a mucous membrane continued from these fossæ, explain the sense of congestion and fullness known as "cold in the head."

The outer surface, or face of the boxes, looks very much in color like the common clarified quill, is semi-translucent, very square, and very smooth. In referring to the view of the skull (Fig. 1), this surface will be seen entering into the composition of the orbital cavity.

The portion of the ethmoid which receives and articulates the process passing upward from the inferior turbinated bone is a hook-like projection from the under surface of these lateral masses. It is called the unciform process, and assists in narrowing the orifice of the antrum and supporting the masses.

The internal surface of each lateral mass approaches the perpendicular plate. At the upper part is the narrow fissure, bounded by a scroll-like process on the surface, known as the superior meatus. The scroll has received the name of the superior turbinated bone. Below this first scroll, on the same surface, is a second. This second

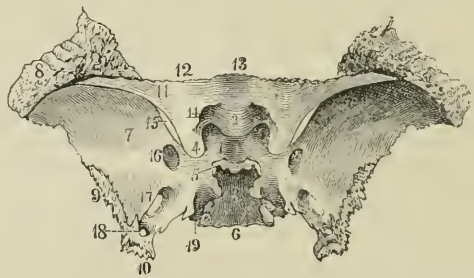
scroll is called the middle turbinated bone, and the space below it, between it and the inferior turbinated bone, is the middle meatus.

In looking at the ethmoid bone in position, it will be seen to be wedged in between the nasal, frontal, lachrymal, and maxillary bones in front, and the sphenoid behind; below, it is supported by the turbinated, vomer, and palate bones. Blows received upon the bridge of the nose have not unfrequently carried the crista galli into the substance of the brain; while maxillary diseases find an easy road to the base of the cranium through the nasal communication with the ethmoidal cells.

THE SPHENOID BONE.

The sphenoid bone, named from its wedge-like relations to other bones of the cranium, has been frequently and most aptly compared in appearance to a "bat" with extended wings and unflexed legs.

FIG. 11.—THE SPHENOID BONE—UPPER VIEW.

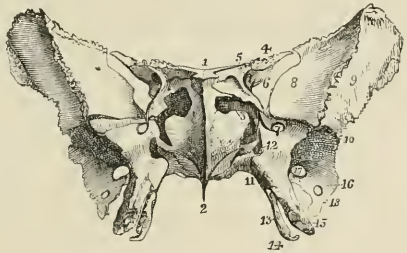


1, pituitary fossa; 2, olivary process; 3, declivity; 4, anterior clinoid process; 5, posterior clinoid process; 6, posterior border of the body; 7, cerebral surface of the great wing; 8, articular surface for the frontal bone; 9, articular border for the temporal bone; 10, spinous process; 11, small wing; 12, border articulating with the orbital plate of the frontal bone; 13, border joining the ethmoid bone; 14, optic foramen; 15, sphenoidal foramen; 16, rotund foramen; 17, oval foramen; 18, spinous foramen; 19, groove for the internal carotid artery.

In looking at the disarticulated bone, we first observe a central portion or body; this body is irregularly square, and marked on all its surfaces with features which one at once infers to be possessed of anatomical significance. Extending laterally on either side from the body are two great wings; these wings are made double by a lacerated foramen, and instead of being spoken of and described as a single pair, are mostly viewed as two pairs—the larger portion being called the greater wings, the smaller pair the lesser wings.

The legs, falling from the base of the cranium, are found separated by a notch into two portions,—this separation, however, being much more marked behind than in front: they have received the name of pterygoid processes.

Fig. 12.—The Sphenoid Bone—Front View.



1, 2, sphenoidal crest and rostrum for joining the nasal plate of the ethmoid bone and the vomer; 3, entrance of the sphenoidal sinuses; 4, small wing; 5, optic foramen piercing its base; 6, sphenoidal foramen; 7, rotund foramen; 8, orbital surface of the great wing; 9, temporal surface of the same; 10, ridge separating the temporal and spheno-maxillary fossæ; 11, position of the pterygo-palatine canal; 12, pterygoid canal; 13, internal pterygoid process, ending in a hook 14; 15, external pterygoid process; 16, spinous process; 17, oval foramen; 18, spinous foramen.

Beginning a study of the body from its superior or cranial surface, a first attention is naturally directed to a saddle-like depression occupying a large portion of this face. This depression lodges a little body attached to the floor of the third ventricle, called the pituitary body; hence is called by many authors the pituitary depression or fossa: from its resemblance to the Turkish saddle it is as frequently named the sella turcica. A number of little pits seen on the floor are foramina transmitting to the body vessels of nutrition. On either side are two processes; these correspond to two others, terminating the plate of bone which represents the back of the saddle. The four have been compared to the posts of a bedstead, and called clinoid processes. Passing forward, an olive-shaped eminence is next noticed—the olivary process; and directly in front of this, a groove or oblong fossa. This groove has resting in it the commissure of the optic nerve; hence called the optic groove. Passing directly forward, we find the surface terminate in a spine or projecting point; this point articulates the surface with the ethmoidal bone, and is called the ethmoidal spine; between this spine and the optic groove is a slight eminence falling off on either side into a line of depression; these lines lodge the

olfactory nerves. Two foramina, seen on this surface at either terminus of the optic groove, are called optic foramina; they transmit to the orbital cavities the optic nerves and ophthalmic arteries. From the back of the saddle the surface is seen to slope gradually downward; this concave plane lodges the medulla oblongata, and terminates at the line of union with the occipital bone. On either side is situated a tortuous depression, in which lies the internal carotid arteries and cavernous sinuses.

Turning now to the anterior surface, we observe, first, a rostrum or beak, for articulation with the perpendicular plate of the ethmoid. On either side of this beak are seen scrolls of bone, or rather lamellæ,—the sphenoidal turbinated bones, as they are called. These lamellæ we find imperfectly close sinuses which hollow out the substance of the body, and which, in articulation, are found to communicate with the upper part of the nose, and frequently with the ethmoidal cells; being lined with the mucous membrane of the nares, and subjected consequently to the sympathies of continuity.

The inferior surface presents us, first, with this rostrum or beak; continued from the anterior face, this spine is received into a groove or fissure in the vomer. On either side are laminæ of bone, which pass to the pterygoid processes; these plates or laminæ are called vaginal processes. Close to the pterygoid process is seen a groove, which the sphenoidal process of the palate-bone converts into a canal; this groove transmits the pterygo-palatine vessels and pharyngeal nerve.

The posterior surface in most bones exhibits simply a quadrilateral sawed surface, a union existing with the occipital at this point, which has required the saw for its separation. Hence it has been a common practice with many writers to consider the sphenoid and occipital as one bone, and to refer to them as the spheno-occipital bone.

The wings, which may next claim attention, are called the greater and lesser, the separation existing at the lacerated foramen. The greater wings extend laterally, and assist largely in forming the floor of the fossæ which receive the middle lobes of the brain. Looked at from the encranial aspect, attention is first attracted to six foramina—three on either side. The first of these is a round hole, and is called the foramen rotundum; it transmits from the brain to the superior maxillary bone the second branch of the fifth nerve. The second hole is oval in shape; hence called the foramen ovale: it transmits the third, or inferior maxillary branch of the fifth. The third, the foramen spinosum, transmits the middle meningeal artery. A fourth foramen is occasionally found in the great wing—

the vesalii. When existing, it is occupied by a small vein. The general floor of these wings is concave, and marked with elevations and depressions for the accommodation of neighboring convolutions.

Turning the bone, these wings are seen to be made up of three surfaces: the encranial face, as just described; an external surface, occupying, when in articulation, a place in the base of the skull; and an orbital surface.

The external surface is irregularly convex, and is separated into two portions by a ridge called the pterygoid. The superior of these two faces is seen entering into the composition of the temporal fossa for lodgment of temporal muscle. The inferior face lies beneath the zygoma, and forms part of the fossa of this name, giving attachment to the external pterygoid muscle. Running from the postero-lateral angle of the surface is seen a prolonged spine: to this is attached the laxator tympani muscle and the internal lateral ligament of the lower jaw.

The orbital face of the wing assists in forming the outer boundary of the orbit; it is quadrilateral in form, smooth, and concave. Below, it has a somewhat rounded border, and enters into the formation of the spheno-maxillary fissure; internally, it assists in forming the sphenoidal fissure. At the lower edge of the inner border is a delicate spine, giving origin to one head of the external rectus muscle. The foramina generally seen on this face are called orbitar foramina: they transmit small arteries.

The lesser wings, frequently described as the processes of Ingrassias, are seen on the encranial surface extending outward, overlying at their apices the great wings. These wings are triangular in shape, having their bases associated with the body of the bone. In articulation they complete the posterior boundary of the anterior fossæ of the cranium, and are lodged in the fissure of Sylvius. The fissure or slit which separates them from the great wings is called the lacerated foramen. It transmits the first or ophthalmic branch of the fifth nerve, the third, fourth, and sixth nerves, and the ophthalmic vein. The lesser wings are connected with the body by two footstalks, inclosing within them and assisting in forming the optic foramina. A process seen jutting backward from the foramen is called the anterior clinoid process; to it is attached the common tendon of the recti muscles.

The legs or pterygoid processes, seen falling from the point of union of the great wings with the body, consist of two plates, separated behind by a deep notch, but united almost fully in front. The ex-

ternal plate is broad and curved, and forms part of the zygomatic fossa; to it is attached the external pterygoid muscle. The internal face forms part of the pterygoid fossa, and gives origin to the internal pterygoid. The internal plate has a particular interest; it ends in a tubercle or hook-like process, which is felt in the mouth just back of the maxillary tuberosity. The hamular process around it turns the tendon of the tensor palati muscle—a tendon divided in the operation for cleft palate. The base of this internal plate forms a fossa, the scaphoid, from which originates the tensor muscle just alluded to. The outer surface of this plate forms the pterygoid fossa; the inner surface assists in forming the outer posterior boundary of the nares.

The base of the pterygoid process is quite broad, and in front gives support to Meckel's ganglion. The vidian canal passes through it.

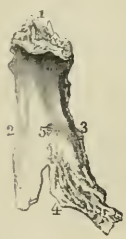
The sphenoid articulates with all the bones of the cranium, with the two malar, the vomer, and two palate bones of the face.

The muscles to which it gives origin are the temporal, external, and internal pterygoid, tensor palati, laxator tympani, levator palpebræ, the recti of the eye, and superior oblique of eye.

THE NASAL BONE.

The figure exhibits the faces of a left nasal bone articulating with its fellow, which is its counterpart; the two occupy the quadrilateral space existing between the two maxillary bones and the frontal, and form the prominence known as the nasal bridge. That these bones must vary considerably in shape would be inferred from variations in the shape of the bridge so frequently seen. Looked at from above downward, each bone is observed to be concave, while viewed from side to side, it is convex; several light grooves are commonly noticed on the surface for the accommodation of vessels; the foramen seen about the center transmits a small vein.

FIG. 13.—NASAL BONE.



ANTERIOR VIEW OF THE LEFT NASAL BONE. 1, frontal border; 2, nasal border; 3, maxillary border; 4, lower border; 5, nasal foramen.

The inner surface reverses relations with the outer—being convex from above below, concave from side to side. Its only feature of interest is a groove for the lodgment of the nasal nerve.

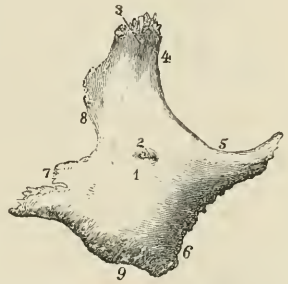
The borders of the bone are three articular and one free. The superior, serrated and somewhat narrow, fits in the frontal notch, forming the fronto-nasal artic-

ulation. The lateral border is beveled, at the expense, above, of the internal plate, below, of the external, and fits with corresponding bevelings of the nasal processes of the maxillary bone. Internally, or mesially, the bone articulates with its fellow of the opposite side, being prolonged below into a crest, which forms a part of the nasal septum, and articulates with the nasal spine of the frontal above, and the ethmoidal perpendicular plate below. The lower border is free, at least so far as any bony articulation is concerned, giving attachment by a thin, sharp edge to the lateral cartilage of the nose. A notch, seen at the center of this border, transmits the nerve occupying the groove on the inner surface.

THE MALAR BONE.

The malar, or cheek bones, may be likened to two bony pads laid on either lateral aspect of the face for the purpose of influencing a general convexity. Each bone is irregularly quadrilateral, supported above by articulation with the frontal, sphenoid, and superior maxillary bones; in front by the malar process of the maxillary; posteriorly by the zygomatic process of the temporal.

FIG. 14.—THE MALAR BONE.



OUTER VIEW OF THE RIGHT MALAR BONE. 1, external or facial surface; 2, malar foramen; 3, frontal process; 4, 5, orbital border; 6, maxillary border; 7, zygomatic process; 8, temporal border; 9, inferior border.

The bone presents two surfaces, four processes, and four borders. The external surface, convex and smooth, presents little of interest; the foramen, seen upon this face, has its place sometimes occupied by two or more; they are simply the orifices of canals, transmitting unimportant vessels. The surface, in relationship, is mostly covered by the orbicularis palpebrarum muscle, while the zygomatici have origin from the lower and inner aspect.

The internal face is concave, and assists in forming, above, the temporal fossa, below, the zygomatic. It yields partial origin to both the temporal and masseter muscles.

Of the four processes, the orbital is the most interesting; turning at right angles with the external face of the body, it assists in forming a portion of the outer wall of the orbit and orbital ridge. The frontal is thick and serrated, and articulates with the external angu-

lar process of the frontal bone. The maxillary is rough, and triangular in shape, and attaches the bone in front. The zygomatic is sharp and flat, and forms part of the yoke overlying the ridge separating the zygomatic from the temporal fossa.

The four borders are the orbital, the maxillary, zygomatic, and temporal. These borders correspond with the relations named, but have no interest apart from the processes.

THE LACHRYMAL BONE.

Looking at the view, or, much better, at the articulated skull, the lachrymal bone is seen to occupy a position of some prominence in the composition of the orbit. A ridge on its anterior surface divides it into two parts: one part, called its orbital face (bounded above by the orbital face of the horizontal plate of the frontal bone; laterally, by the os planum of the ethnoid; below, by the orbital surface of the maxillary bone), enters into the composition of the orbital cavity. The face, to the inner side of the ridge, is smooth and concave, and articulates with the nasal process of the maxillary bone, internally, and with the lachrymal process of the turbinated, below; these three bones in their union form the ductus ad nasum, or lachrymal canal, transmitting the tears to the inferior meatus.

FIG. 15.—THE LACHRYMAL BONE.

EXTERNAL VIEW OF THE RIGHT LACHRYMAL BONE. 1, orbital surface; 2, lachrymal fossa; 3, small process bounding the latter inferiorly; 4, frontal border; 5, ethmoidal border; 6, maxillary border; 7, process articulating with the turbinated bone.

The bone, by its internal or nasal surface, enters into the composition of the middle meatus, and assists in filling in the anterior ethmoidal cells. Like the external surface, it is divided into two faces, the line of division being a depression corresponding with the ridge on the opposite surface.

One muscle has its attachment to this bone—the tensor tarsi.

THE HYOID BONE.

The os hyoides is the bone situated on the anterior part of the neck between the chin and sternum. In shape it somewhat resembles the ordinary horseshoe, and is held in place entirely by a series of antagonizing muscles, of which it gives attachment to

some ten pairs. A glance at the bone naturally divides it into a body and four processes or horns; the greater of these cornua extend quite widely over the lateral aspect of the neck, giving attachment to the hyoglossus, middle constrictor of the pharynx, and thyro-hyoid muscles, and by a bulb, constituting its extremity, to the thyro-hyoid ligament; it also serves as our best guide to the position of the lingualis artery. The lesser cornua are simply two conical eminences, more or less prominent on different specimens. Starting out at the point of junction of the great horns with the body, they look upward toward the chin, and serve to afford attachment to the stylo-hyoid ligaments.

FIG. 16.—THE HYOID BONE.

1, body; 2, greater horn; 3, lesser horn.

The body is irregularly quadrilateral in shape, convex in front, concave behind. A crucial ridge, the intermuscular, divides the front face into four fossæ. This surface is exclusively devoted to the attachment of muscles; above, to the genio-hyoid and the genio-hyoglossus; below, to the stylo-hyoid, mylo-hyoid, and digastricus. The posterior surface is smooth and concave, and occupies a position just in front of the epiglottis, being separated from it, above, by some cellular tissue and a membrane called, from its relationship, the thyro-hyoid.

CHAPTER II.

THE MOUTH.

STUDYING the mouth from the living subject, we remark, first, an entrance of two fleshy folds, the lips; separating these, we are met by a second portal, the teeth; the space existing between these two entrances is called the hall or vestibule; opening this inner gateway, by depressing the lower jaw, we are introduced into the oral cavity proper.

The mouth is the commencement of the alimentary canal. It has as offices, the reception of food, gustation, mastication, and insalivation; consequently must possess organs and agencies pertinent to these ends.

Looking into the mouth, we observe that it is an oval cavity, bounded posteriorly by a veil or curtain. This falls obliquely toward the fauces, having a central pendulum, terminating laterally in arched curves. We can see beneath this veil, or between it and the base, and thereby recognize the cavity we are viewing to be simply the commencement of a canal. Every part of the cavity we remark to be covered by a common membrane, which membrane we find to associate externally on the lips with the common skin; internally we see it passing back of the veil down the throat,—this is a mucous membrane, and examination reveals it to be continuous from this cavity to the outlet of the rectum. The teeth, thirty-two in number in the adult, are placed in two harmonizing or articulating arches or curves, and are, in shape and character, correspondent with omnivorous habits. Thus certain of their number, the incisors, as they are called, are so arranged as to cut or incise. Certain others, the cuspidati or canines, are spear-shaped, and tear or lacerate. Still others, the bicuspidati and molars, have broad and roughened surfaces, acting the part of grinders. The tongue, a muscular body, rests within the lower dental arch; it evidently is fitted and suited to preside over the labor of the teeth, receives or rejects articles to be comminuted, places and retains such articles in position to be

masticated, and, when ready to be swallowed, rolls up masses into boluses, and passes them into the pharynx.

The roof of the cavity, beginning with the palatine faces of the teeth, is made up evidently of hard and soft tissues. The hard portion we discover to be the flesh-covered alveolar and palatine processes of the superior maxillary bones and the palate processes of the palate bone. The soft portion dissection reveals to be a simple attached basement tissue covered with the common membrane.

Continuing to look for a short period into the mouth, we observe that jets of fluid are occasionally sent up from the anterior floor just back of the lower central teeth. We also see drops constantly issuing from an orifice situated on the cheek by the side of the superior second molar tooth. This fluid is the salivary secretion, and comes from glands situated in the immediate neighborhood. Besides this salivary fluid, pearly drops are seen, more or less plainly, over the surface of the common mucous membrane. This is mucus, and is the product of the follicles, crypts, or glands of the common membrane.

The mouth, then, we may say is made up of, and invites a study of, the lips, cheeks, gums, teeth, mucous membrane, tongue, hard and soft palate, and salivary glands; and if we accept, as indeed surgically we must, that the cavity begins with the lips and ends at the posterior wall of the pharynx, then we include in the study all the relations which belong to the posterior entrance.

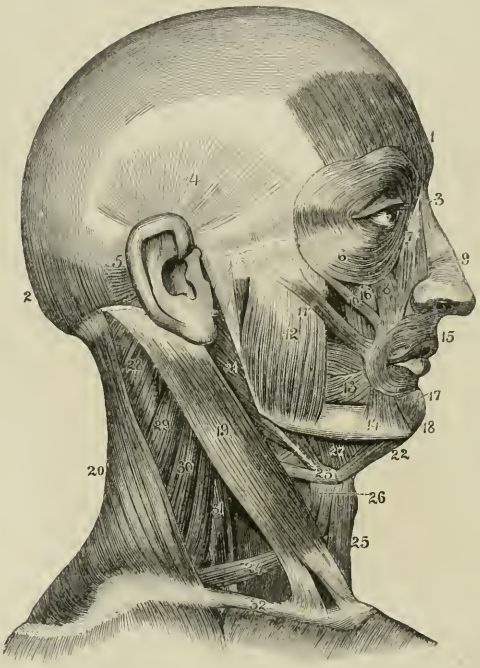
The lips and cheeks are alike in their composition, and are truly a part and parcel of each other. First, in the dissection, we have a layer of skin on the outside and a layer of mucous membrane on the inside. Removing the skin, we expose a layer of cellular fascia, in which is more or less fatty tissue. This superficial fascia, as it is called, differs from other fasciæ of the same signification, in not being a distinct or laminated tissue. It is intimately connected with the skin, and more intimately associated with the muscles. Removing this, a complex grouping of muscles is exposed,—the muscles of expression.

The view (Fig. 17) expresses so fully the position and signification of these muscles that it scarcely seems necessary to enter on any description of them. The orbicular, or sphincter of the lips, may, however, be specially noted, as its influence is concerned in retracting wounds of the part. In studying the muscles of the face, it will be observed that they naturally arrange themselves into groups. Thus we have

a group that are elevators, another that are depressors. Then groups that pertain to particular regions, as the nasal, superior maxillary, inferior maxillary, intermaxillary, etc. Surgically, however, the information they possess is sufficiently elicited in comprehending their general plan and arrangement.

Situated upon, and running among these muscles, we have the

FIG. 17.—MUSCLES OF THE FACE.

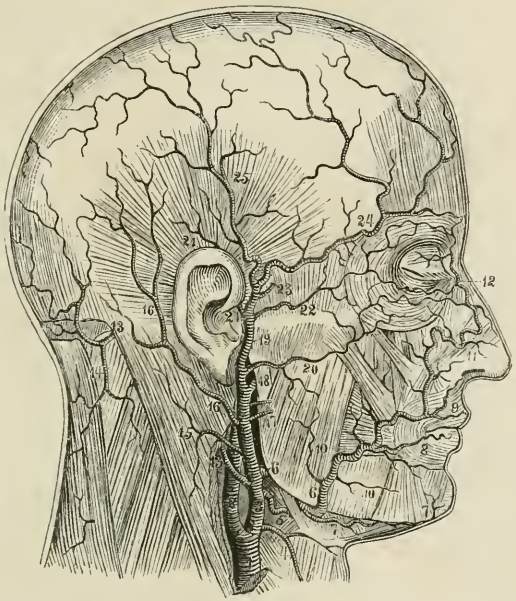


MUSCLES OF THE HEAD AND NECK. 1, 2, occipito-frontal muscle; 1, its frontal belly; 2, its occipital belly; 3, nasal pyramidal muscle; 4, superior, and 5, posterior auricular muscles; 7, labio-nasal elevator; 8, elevator of the upper lip; 9, nasal compressor; 10, 11, zygomatic muscles; 12, masseter muscle; 13, buccinator; 14, depressor of the oral angle; 15, oral orbicular muscle; 16, elevator of the oral angle; 17, 18, depressor of the lower lip; 19, sterno-mastoid muscle; 20, trapezius; 21, posterior belly of the digastric and the stylo-hyoid muscle; 22, anterior belly of the former; 23, loop of fibrous tissue attaching the tendon of the digastric muscle to the hyoid bone; 24, omo-hyoid muscle; 25, sterno-hyoid; 26, sterno-thyroid, seen to the outer side and behind the anterior belly of the omo-hyoid; 27, mylo-hyoid; 28, splenius; 29, elevator of the scapular angle; 30, 31, middle and anterior scalene muscles; 32, clavicle.

arteries of the face. These are all branches of the external divi-

sion of the common carotid, and will be found in the dissections distributed exactly as seen in the view. The facial, the third branch of the carotid externus, is observed to cross over the lower jaw just in front of the masseter muscle; and, in the subject, is seen to emerge from or beneath the submaxillary gland, generally passing through its substance. Its branches are ten in number; four are offshoots from its cervical portion; six are facial. The facial

FIG. 18.—ARTERIES OF THE FACE.



THE EXTERNAL CAROTID ARTERY AND ITS BRANCHES. 1, right common carotid; 2, internal carotid; 3, external carotid; 4, superior thyroid; 5, lingual; 6, facial; 7, submental; 8, inferior coronary; 9, superior coronary; 10, muscular branches; 11, lateral nasal artery; 12, angular artery; 13, occipital artery; 14, descending cervical; 15, muscular branch; 16, posterior auricular artery; 17, parotid branches; 18, internal maxillary; 19, temporal; 20, tranverse facial; 21, anterior auricular; 22, supraorbital; 23, middle temporal; 24, anterior temporal; 25, posterior temporal artery.

branches are, first, the inferior labial, which passes forward under the depressor anguli oris, and supplies the lower part of the lip, anastomosing with all the subjacent vessels, the submental, inferior coronary, and inferior dental arteries. The coronaries—the second and third of these branches—penetrate the substance of the underlying muscles, and pass around the lips immediately beneath the mucous

membrane; their pulsations may be very plainly felt; in many persons these vessels are of such large size as to render hemorrhage from them a matter of some trouble to control.

The lateralis nasi, the fourth of the branches, ascends along the side of the nose, supplying its alæ and dorsum. The fifth, the angular, passes between the inner canthus and nasal bridge. It gives off sub-branches to the orbicularis muscle, to the lachrymal sac, and to the integument of the suborbital region, and finally loses itself in an anastomosis with the ophthalmic artery. A point

FIG. 19.—THE COMMON CAROTID, WITH ITS DIVISIONS.

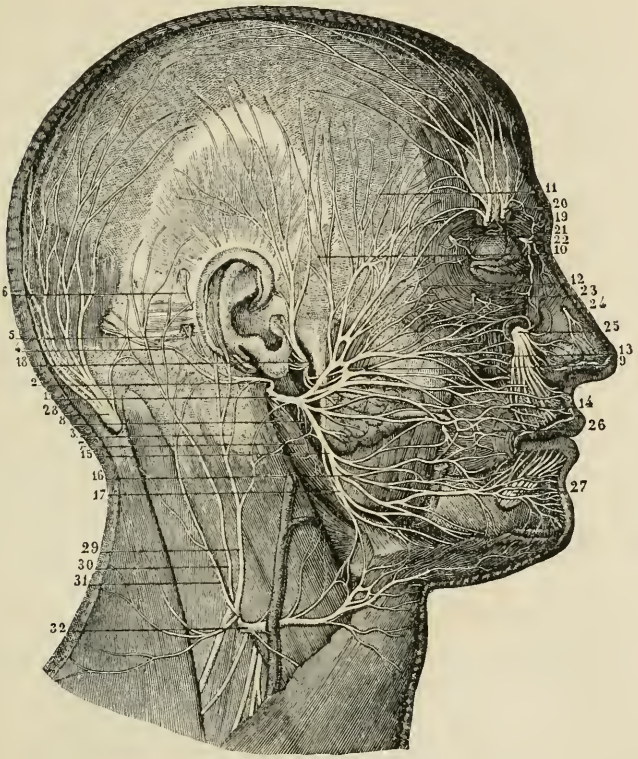
LEFT COMMON CAROTID DIVIDING INTO THE EXTERNAL AND INTERNAL CAROTID ARTERIES. 1, common carotid artery; 2, internal carotid; 3, external carotid; 4, superior thyroid; 5, lingual; 6, pharyngeal artery; 7, facial; 8, inferior palatine and tonsillar arteries; 9, submaxillary; 10, submental; 11, occipital; 12, posterior auricular; 13, parotid branches; 14, internal maxillary; 15, temporal artery; 16, subclavian artery; 17, axillary; 18, vertebral artery; 19, thyroid axis; 20, inferior thyroid giving off the ascending cervical; 21, transverse cervical; 22, suprascapular; 23, internal mammary artery.

in the view to observe is, that the inferior and all the mesial line of the face are supplied by branches of a common trunk, and that this trunk is compressible on the lower jaw just in front of the masseter muscle, facial hemorrhage being thus perfectly under control by compression.

THE NERVES OF THE FACE.

This view beautifully exhibits the distribution of the branches of the facial nerve. The main trunk, seen emerging just below the lobe

FIG. 20.—NERVES OF THE FACE.



1, trunk of the nerve emerging at the stylo-mastoid foramen; 2, its deep auricular branch; 3, anastomosis of the latter with the great auricular nerve of the cervical plexus; 4, 5, 6, branches to the contiguous muscles; 7, 8, branches of the facial to the digastric and stylo-hyoid muscles; 9, temporo-facial division of the nerve; 10, branch to the temple, anastomosing with the auriculo-temporal nerve; 11, temporal branches; 12, zygomatic branches; 13, infraorbital branches; 14, 15, cervico-facial division of the facial nerve; 14, buccal branches; 16, inferior maxillary branches; 17, cervical branches; 18, auriculo-temporal nerve; 19, 20, terminal branches of the frontal nerve; 21, terminal branch of the lachrymal nerve; 22, external nasal nerve; 23, branch of the temporo-malar nerve; 24, terminal branch of the internal nasal nerve; 25, infraorbital nerves; 26, anastomosis between the buccal branch of the inferior maxillary nerve and the buccal branches of the facial nerve; 27, terminal branches of the inferior dental nerve; 28, great occipital nerve; 29, 31, branches of the great auricular nerve; 30, small occipital nerve; 32, superficial cervical nerve, anastomosing with the facial nerve.

of the ear, in front of the anterior border of the sterno-cleido-mastoideus, is the portia dura, or hard portion of the seventh nerve, the motor nerve acting on the muscles of expression. The nerve arises from the medulla oblongata, passes outward over the crus cerebelli, and enters the auditory meatus with the soft or auditory portion; passing to the bottom of this meatus, it enters the Fallopian aqueduct, follows the serpentine course of this canal until it arrives at the stylo-mastoid foramen, whence it emerges, as seen upon the outside of the face. While, however, in the temporal bone, the nerve connects with several others, and forms a ganglion, the intumescentia gangliformis, as it is called.

Issuing from the stylo-mastoid foramen, the facial associates with the pneumogastric, glosso-pharyngeal, carotid plexus, auricularis magnus, and auriculo-temporal. Passing to the face, it unites with the three divisions of the fifth nerve.

In front of the ear the nerve is seen to divide into two primary divisions or trunks, the temporo-facial and cervico-facial. The temporal, the larger of the two, passes through the parotid gland, crosses the neck of the lower jaw, and divides into three sets of branches, distributed to the temporal, malar, and infraorbital regions. The cervico-facial passes downward and forward through the gland, and divides into buccal, supra- and inframaxillary branches. The manner of distribution and anastomoses is perfectly shown in the dissection.

THE VEINS OF THE FACE.

The veins of the face will be seen to correspond quite closely with the arterial distribution. Surgically they are, however, of little import, as it is seldom that wounds of them are of sufficient consequence to command any direct attention; they pass their blood into one or another of the three jugulars, being not by any means constant in the selection. Between them all, however, the most thorough anastomosis is always found to exist, thus rendering it really of little consequence what may be the direct downward course of the current. The veins of the antero-exterior head are the facial, the temporal, the internal maxillary, and temporo-maxillary.

The facial, commencing at the inner angle of the orbit, is formed by the confluence of the supraorbital, palpebral, nasal, and angular veins. It commences its course downward and outward, passing beneath the zygomatic muscles, receiving the superior and inferior labial veins, the buccal, and masseteric; passes to the base of the

jaw, receiving just below it the submental, the inferior palatine, the submaxillary, and ranine veins, and, finally, with a great branch, re-

FIG. 21.—VEINS OF THE FACE.

VEINS OF THE HEAD AND NECK. 1, frontal vein; 2, nasal vein; 3, 4, labial veins; 5, facial vein; 6, lingual vein; 7, internal jugular vein; 8, 9, posterior and anterior temporal veins; 10, transverse facial vein; 11, internal maxillary vein; 12, posterior auricular vein; 13, external jugular vein; 14, posterior, 15 anterior jugular veins. *a*, external carotid artery; *b*, sterno-mastoid muscle; *c*, trapezius; *d*, pectoral muscle; *e*, deltoid muscle.

ceived from the temporo-maxillary, loses itself in the deep jugular. The temporal commences by a plexus on the side of the head and

vertex, passes downward in front of the ear, receives the transverse facial, posterior, auricular, occipital, and deep maxillary veins, enters the substances of the parotid gland, and, finally, being enlarged by these various branches, becomes the external jugular.

The internal or deep maxillary is, in its origin, a series of veins collecting the blood from the parts supplied by the internal maxillary artery and adjacent parts. These various veins, the middle meningeal, deep temporal, pterygoid, masseteric, buccal, and inferior dental, forming the common trunk, empty into the temporal.

The temporo-maxillary is simply the name given to that part of the temporal vein below the point of entrance of the maxillary—either name is used with equal propriety.

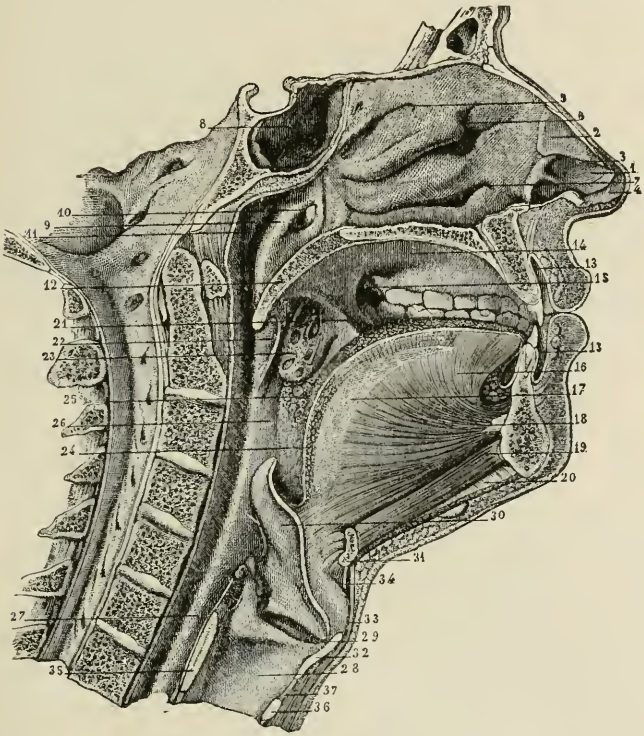
SECTIONAL EXPRESSION OF MOUTH.

The view (Fig. 22) represents a section directly through the center of the skull from before backward, and perfectly exhibits the character of the mouth and its associations. Below is seen the tongue in its relations, in front, to the genial turbercles; behind, to the epiglottis. A fossa between the root of this organ and the epiglottis, one each side of a common center, the frænum epiglottis, is particularly worthy of note, as it is a frequent receptacle for fish bones and other foreign bodies, giving sometimes much trouble in their removal. The free surface of the tongue is seen to be convex, while the section reveals its common body to be triangular with the apex, looking forward.

The roof of the mouth, seen above, is remarked to be a quite thin plane, forming as well the floor of the nose. Its relation to the oral cavity is concave, but differing widely in various persons, being in some almost flat, in others very deep. The anterior portion, bony, will be recognized as being formed by the palatine processes of the maxillary and palate bones; the posterior portion, soft, veil-like, and movable, is the velum, terminating in the uvula in the center, just above and in front of the tip of the epiglottis; laterally, in two pillars or half arches, called respectively the anterior and posterior pillars. The first of these—the one seen in the view as associating itself with the tongue—is formed by the projection of the palato-glossus muscle; the second, or posterior, is the projection likewise of a muscle, the palato-pharyngeus, passing from the veil to the pharynx; the fossa existing between these pillars lodges the tonsil gland. The hard portion of the palate or oral roof is frequently the

seat of necrosis; it will be remarked that only the smallest loss of substance is required to associate the two cavities. The isthmus of

FIG. 22.—SECTIONAL VIEW OF THE NOSE, MOUTH, PHARYNX.



VERTICAL SECTION OF THE FACE AND NECK, THROUGH THE MEDIAN LINE ANTERO-POSTERIORLY, EXPOSING TO VIEW THE NOSE, MOUTH, PHARYNX, AND LARYNX. 1, oval cartilage of the left nostril; 2, triangular cartilage; 3, line of separation between the two; 4, prolongation of the oval cartilage along the column of the nose; 5, superior meatus of the nose; 6, middle meatus; 7, inferior meatus; 8, sphenoidal sinus; 9, posterior part of the left nasal cavity, communicating with the pharynx; 10, orifice of the Eustachian tube; 11, upper extremity of the pharynx; 12, soft palate, ending below in the uvula; 13, interval of the mouth between the lips and jaws; 14, roof of the mouth, or hard palate; 15, communication of the cavity of the mouth with the interval between the jaws and cheek; 16, tongue; 17, fibrous partition in the median line of the latter; 18, genio-glossal muscle; 19, genio-hyoid muscle; 20, mylo-hyoid muscle; 21, anterior half arch of the palate; 22, posterior half arch of the palate; 23, tonsil; 24, 25, floor of the fauces; 26, 27, pharynx; 28, cavity of the larynx; 29, ventricle of the larynx; 30, epiglottis; 31, hyoid bone; 32, 33, thyroid cartilage; 34, thyro-hyoid membrane; 35, 36, cricoid cartilage; 37, vocal membrane.

the fauces, the space between the two arches, is bounded, above, by the margin of the palate; below, by the base of the tongue; laterally, by the half arches and amygdalæ.

The Tonsils.—The tonsils are glandular organs, situated one on either side of the isthmus. These bodies are made up of many lobules, having many sulci lined by involutions of the common mucous membrane. They are not unfrequently the seat of such hypertrophy as to make necessary their amputation, while in their sulci may lodge débris, which, in its retention and decomposition, becomes one of the sources of an unpleasant breath. Externally these bodies are in very close relation with the internal carotid arteries, a point necessary to be kept in remembrance in performing operations on them.

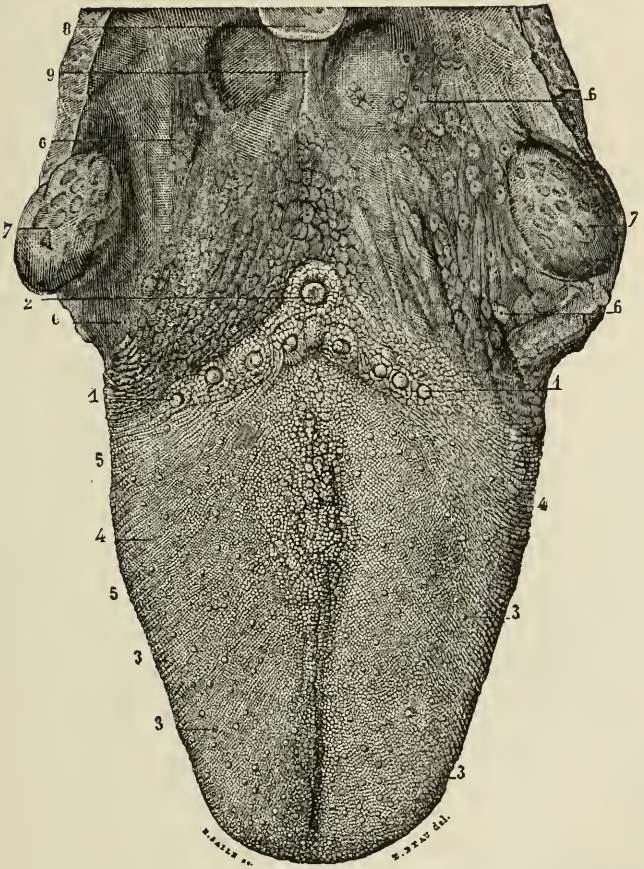
The relationship of a bolus of food with the pharynx, and its direction, over the chink of the glottis into the œsophagus, by the epiglottis, is clearly exhibited by the drawing.

The Tongue.—Dissection of the tongue reveals it to be a somewhat complex body, although made up in the great mass of its bulk by muscular substance. Attached to the inferior maxillary bone in front, and to the hyoid behind, it yet moves with the greatest freedom and latitude in either direction, giving us the idea that if it is muscular substance, it must be free muscle set upon fixed muscles, and this is practically the case as is understood by studying a dissection.

The muscular structure of the tongue is made up of five distinct pairs and certain non-attached fasciculi. The body, as its surface is concerned, is seen with a base looking backward into the fauces, and a tip, which represents the apex of a pyramid. Beginning the study of the organ with its relations to the hyoid bone, we remark, first, that from this bone arises a muscle, the hyoglossus, which, passing almost directly upward, enters, with the stylo-glossus, the root of the body, and expands itself laterally and forward. Passing toward the center of the bone, we remark a second muscle, the genio-hyoglossus, which, having apparent origin from the genial tubercles, radiates downward and upward, attaching one of its wings to the os hyoides, the other spreading out to assist in the formation of the tongue. The stylo-glossus, the third muscle, arises from the styloid process of the temporal bone, passes downward and forward, and occupies or makes up either lateral aspect from the tip to the bone. The fourth, the lingualis, seen between the stylo-glossus and genio-hyoglossus, passes from the tip to the base, having, indeed, some few of its fibers continued to the os hyoides. The fifth, the palato-glossus, is the muscle of the anterior half arch; it assists in forming the base and side. The unattached fibers are certain longitudinal and transverse bands running through the sub-

stance of the organ. The tongue, as an organ of nutrition, is adapted most happily, through its muscular character, to preside over the acts of mastication, and, this process completed, to transfer the comminuted mass back into the grasp of the pharyngeal con-

Fig. 23.—Upper Surface of the Tongue.



1, 2, V-like row of the circumvallate papillæ; 3, capitate papillæ; 4, 5, conical papillæ; 6, 6, floor of the fauces, with numerous simple follicular glands; 7, tonsils; 8, summit of the epiglottis; 9, the middle glosso-epiglottic frænum, with depressions on each side bounded externally by the lateral frena.

strictors. Its ability and variety of action is comprehended by a single moment's observation of the study exhibited in a dissection.

Fig. 23, exhibiting the magnified upper surface of the organ, dis-

covers it covered with mucous membrane, dotted here and there with more or less regularly located papillæ, of varying size and character.

The mucous membrane envelops the tongue wherever the body has free surface. Above, it is dense, and affords support to numerous papillæ; below, it is exceedingly delicate, and is traceable through the ducts of the submaxillary and sublingual glands.

The papillæ, seen upon the dorsum, are cone-shaped projections of homogeneous tissue, holding arteries, veins, and nerves in plexiform arrangement; they are located in three distinct sets, each having distinctive features.

The most posterior are the largest, and occupy a position which very much resembles the letter V; they may be likened to inverted cones, the apices resting in cup-shaped depressions of the mucous membrane, hence surrounded each by a valley. They are variously

FIGS. 24 AND 25.—PAPILLÆ OF TONGUE.

DIAGRAM OF THE PAPILLÆ OF THE TONGUE, moderately magnified. 1, capitate papillæ; 2, conical papillæ; 3, epithelium; 4, the same structure forming bunches of hair-like processes; 5, connective tissue.

PAPILLÆ OF THE TONGUE, highly magnified. 1, conical papillæ; 2, capitate papillæ; 3, simple papillæ, occupying the intervals of the compound papillæ; 4, epithelium ascending from the conical papillæ in hair-like processes; 5, isolated epithelial scales from the latter.

named the maximæ or circumvallatæ. Of this class there are some fifteen; the elevated margins of the fossa surrounding these papillæ

are studded with secondary papillæ. The structure of these bodies is accurately exhibited in the magnified drawing.

The papillæ fungiformes or mediæ are scattered somewhat irregularly over the sides and apex of the organ; they are exceedingly vascular, and closely covered with secondary papillæ; are broad and rounded on their free surfaces, narrow and pointed at their attachment to the tongue; their middle size and red color easily distinguish them. The magnified fungiform papillæ are seen in the drawing.

The smallest or filiform papillæ follow somewhat in their arrangement the order of the maximæ, being interspersed among the fungiformes. They are very minute, and covered so deeply with epithelium as to appear quite white; they are enveloped with secondary papillæ, as exhibited in the figure.

In the tongue, beside these papillæ are found also numerous mucous glands; these bodies, scattered over the whole surface, secrete the ordinary mucus; they differ in no respect from mucous glands wherever situated. In the valleys surrounding the maximæ papillæ these glands are found in larger number than in any other portion of the organ.

A transverse section exhibits the tongue as composed of two symmetrical halves, separated from each other by a fibrous septum, each half consisting, as we have seen, of muscular structure, supplied with vessels and nerves, and having, in most cases, much interposed fat.

The tongue, being an organ of both special and common sense, is furnished with nerves of both signification. Thus the papillæ, at the apex and sides, are supplied with the gustatory filaments from the third branch of the fifth nerve; the great papillæ and base of the organ, from filaments of the glosso-pharyngeal; the muscular structure, from the hypoglossal.

The arteries of the tongue are the lingual, branches of the facial, and ascending pharyngeal. The one of most signification is the first. Each vessel anastomoses with its fellow, just above the frænum, on the under surface of the organ, and is liable to be opened in the operation for tongue-tie. This artery is the second branch from the external carotid; it pursues a course parallel, for a short distance, with the great horn of the hyoid bone lying between it and the hypoglossal nerve. Wounds of the tongue occasionally make the vessel at this point the seat of ligation.

The epiglottis, seen by depressing the dorsum, forms, practically, the base of the organ, being supported in the center by a bridle,

the frænum epiglottis, and at either side by two duplications of the lingual mucous membrane, the glosso-epiglottic ligaments or folds, as they are called; these boundaries form two lateral depressions or fossæ, fossæ lingualis, noticed as being so frequently the seat of the lodgment of foreign particles.

The Gums.—See *Diseases of the Gums.*

The Mucous Membrane. — Practically considered, the oral mucous membrane is to be viewed as commencing at the lips and terminating at the anus, so much is it in sympathy part with part. Anatomically, we view this membrane as consisting of a plane of homogeneous tissue, underlaid by its vascular supply, the vessel being supported by and in cellular tissue. This basement membrane gives support to a covering of squamæ or scales, known as the epithelium, and covers in tissues or organs which have offices of a recrementitial nature.

The tissues, beside the vascular, which underlie the mucous membrane, are the nerves, lymphatics, and the papillary structure. The epithelium, the enveloping tissue, is singularly various in its character, being sometimes columnar, again squamous, again ciliated.

Commencing at the alveolar margin of the lower jaw, this membrane passes over the floor of the mouth, envelops the tongue on all its free surface, forming beneath, by its duplications, the frænum lingua; from the back of the organ it is so reflected as to form the three glosso-epiglottidial folds; from this it lines the pharynx and larynx, and is then continued over the digestive and respiratory tracks, lining, in the latter, the very terminal vesicles.

The mucous cysts or follicles, so plentifully scattered over the oral mucous surface, have, as their office, the secretion of a limpid fluid, which is commonly to be seen standing over the membrane as drops of cold sweat are observed on the forehead in typhoid conditions, the two, indeed, looking very similar. The constituents of mucus are water, the peculiar organic principle called mucosin, and alkaline salts. Mucous glands are variously named, according to their location, as glandulæ labiales, buccales, etc.

Columnar epithelium consists of rod-like particles, bulged near the center by a nucleus, crowded closely together; this variety is found in the air-passages, on the intestinal villi, in the bile duct, and elsewhere. The scaly is found in the alimentary tract as low as the stomach. The glandular seems a constituent of all the glands, being made up of particles bulky and globular. Ciliated epithelium is the columnar variety clothed with secondary particles.

THE SALIVARY GLANDS.

The salivary glands are of the conglomerate order, and are very well represented by an ordinary bunch of grapes. There is, first, a great number of lobules, each lobule being a miniature gland; from these come ducts, or channels of outlet, representing the grape-stems; these all are associated with a common branch or duct, which is the channel of outlet into the mouth.

The parotid, the largest of the salivary glands, is situated in the hollow between the external ear and ramus of the inferior maxillary bone. Its weight varies considerably in different individuals, the mean, however, being in the neighborhood of an ounce. The boundary of the gland above is the zygoma; below, a line carried directly across from the angle of the jaw to the sterno-mastoid muscle. Dissected from its bed, the organ is found quite deeply seated; it extends above into the glenoid fossa of the os temporis, and below rests upon the styloid process and muscles, extending forward to the space between the two pterygoid muscles. The gland is exceedingly vascular, having imbedded in it the external carotid artery, which, in its substance, divides into the temporal, internal maxillary, transverse facial, and posterior auricular. The temporo-maxillary vein also traverses the structure, while the deep jugular and the internal carotid artery lie very close to its deep surface; it is also pierced by the facial and great auricular nerves. Externally, the gland is smooth, and has its lobes protected by a covering, very similar in appearance to the pia mater of the brain. Upon this covering lie two lymphatic ganglia, the enlargement of which is often mistaken for disease of the gland itself. Covering the gland is the parotid fascia, a reflection simply of the common deep fascia of the neck, the platysma myoides, fascia superficialis, and skin. The gland empties its secretion into the mouth through a duct known as that of Steno. This passes across the face between the superficial fascia and muscles, perforating the buccinator opposite the second molar of the upper jaw. A line, designating the position of the duct, and which is most important to be remembered, is drawn from the lobe of the ear to the middle of the upper lip. This duct is quite dense, is about the diameter of a crow-quill, and is some two inches in length; it consists of three coats—an external or fibro-muscular, an internal or mucous, lined with ciliated epithelial scales, and a middle or cellular coat.

The submaxillary, the second in size of the salivary glands, is

situated beneath the lower jaw in the superior cervical triangle, resting, in part, in the submaxillary fossa. The gland is somewhat of the size and shape of an almond-hull, and has a weight of two or three drachms; it is completely enveloped by a triangular envelope, made by two leaves of the deep fascia attached below to the digastric tendon. Directly upon the gland, and within the envelope, are two lymphatic ganglia, which are quite liable to take on inflammatory enlargement; these glands I take to be pretty constant, as I have examined many subjects for them, and mostly with the common result of seeing them. The so-called extirpation of the submaxillary gland is, most generally, the removal of one of these bodies enlarged from inflammatory action; these ganglia may be surgically viewed as being strictly non-vascular, a ligature being seldom needed in operations upon them. The gland itself, on the contrary, is very vascular, the facial artery passing frequently directly through its substance, or so closely connected with the lower surface as to compel the division of it, or some of its large vessels, before the body can be raised from its bed; the lingualis also sends branches to it, while its veins correspond with the arteries. The gland is closely in relation with the parotid, behind, and the lingual, in front, being separated from the first by the stylo-maxillary ligament, and from the latter by the mylo-hyoid muscle. The duct by which the gland conveys its secretion to the mouth is some two inches in length; it passes between the mylo-hyoid and genio-hyoid muscles, and opens by the side of the frænum lingua. It is the most common seat of ranula. The duct is called Wharton's duct.

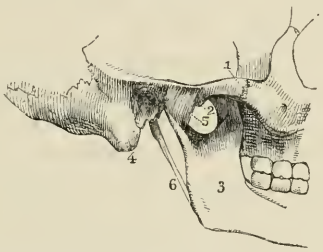
The sublingual is the smallest of the three glands; it lies directly beneath the mucous membrane, being between it and the mylo-hyoid muscle; its weight is about one drachm. The exact position of the gland, as it lies at the lateral aspect of the symphysis, can be seen by raising the tip of the tongue; its bulk will be noticed by elevating the mucous membrane, upon which its excretory ducts, some twenty in number, open; these ducts are called ductus Riviniani, and are distinguished from one or more, called the Bartholin, opening into or near Wharton's duct. The lingual gland, when diseased, may frequently be removed with very little hemorrhage. I have extirpated it without using a ligature.

TEMPORO-MAXILLARY ARTICULATION.

The inferior maxillary bone articulates with the anterior portion of the glenoid cavity of the temporal, forming what is known as an arthrodial or gliding joint. The direct composition of this joint consists of the convex condyloid head of the maxillary bone, the concave surface of the glenoid fossa, interarticular fibro-cartilage, a double synovial membrane, and a loose capsular ligament. (See engraving.)

FIGS. 26 AND 27.—VERTICAL SECTION OF TEMPORO-MAXILLARY ARTICULATION.

VERTICAL SECTION OF THE ARTICULATION OF THE LOWER JAW. 1, is placed above the glenoid cavity; 2, glenoid cavity; 3, interarticular cartilage dividing the joint into two cavities, 4 and 5; 6, an interarticular cartilage separated from a joint, to exhibit its form.



EXTERNAL VIEW OF THE TEMPORO-MAXILLARY ARTICULATION. 1, zygoma; 2, glenoid tubercle; 3, ramus of the inferior maxillary bone; 4, mastoid process; 5, external lateral ligament; 6, stylo-maxillary ligament, a process of the cervical fascia.

The double character of the glenoid fossa, with its fissure of division, its articulating eminence in front, and the cartilage-covered condyle of the maxillary bone, must be understood by looking at the bones. The view represents the parts in position and physiological relation. Above is seen the glenoid cavity; below, the condyle of the inferior maxilla; between, the interarticular fibro-cartilage, with a synovial or lubricating membrane lining each aspect of the joint: the back part of a common capsular ligament is also seen, which, when complete, would be exhibited as enveloping the whole joint. Back of the section, as shown in the view, is that portion of the cavity which lodges the upper part of the parotid gland.

The capsular ligament is an exceedingly loose sac, very much, indeed, like the capsule of the humero-scapular articulation; it is

attached above to the circumference of the glenoid cavity, and in front to the articular root of the zygoma; below, it clasps the neck of the bone just beneath the head.

The interarticular fibro-cartilage is an ovoid plate placed between the two bones; it is supported in its position by a more or less perfect circumferential attachment to the common capsule, the external lateral ligament, and to the tendon of the external pterygoid muscle: below, its face is concave, corresponding with the convexity of the condyle; above, it is concave in front, convex behind, corresponding with the glenoid cavity proper, and the eminentia articularis. In composition the circumference is markedly fibrous, shading off to a cartilaginous center, frequently quite soft, and sometimes perforated.

The synovial membranes, placed, as seen in the view, one above, the other below the interarticular fibro-cartilage, are the ordinary lubricating membranes of closed cavities; they may very well be likened to two simple bags, with parietal attached faces. These bags secrete the synovia, a fluid which looks not unlike the white of an egg, but which is much more oily and resistive in its nature.

From the spinous process, seen on the great wing of the sphenoid bone, a ligament, the internal lateral, descends to be attached to the inner face of the ramus. Behind, from the styloid process of the os temporis, a second, the stylo-maxillary, passes to be inserted just above the angle.

The external lateral ligament is a short, somewhat triangular-shaped band of fibrous tissue, having origin from the zygoma; passing obliquely downward and backward, and inserted about the neck of the condyle, just below the head, it lies in contact with the lateral aspect of the interarticular fibro-cartilage, and really assists in forming, or at least thickening, the common capsule. Externally, it is quite superficial, being only covered by the integuments, except in instances where the upper border of the parotid gland spreads over it. The importance of the character of this articulation renders necessary its careful study by personal dissection.

CHAPTER III.

FIFTH PAIR OF NERVES.

The fifth is an encephalic nerve—that is, coming off from that portion of the cerebro-spinal center lying within the cranium. Called the fifth, because this is the order of its emergence; called also trifacial, because, while within the cranium, it divides into three portions, which portions, in their divisions and subdivisions, are distributed respectively to the superior, middle, and inferior portions of the facial region; called also "trigeminus," a name derived from *tri*, three, and *geminus*, twin, or double, signifying literally three double, triple, referring to its threefold divisions.

The fifth, trifacial or trigeminus, is first discovered as a number of filaments, of which there are two distinct sets, coming off from the sides of the pons Varolii; this is called its superficial origin. The deep, or true origin, can be traced into the substance of the pons as far as the lateral tract of the medulla oblongata. These filaments of origin are called the roots of the nerve, and, being twofold, afford the likeness which exists between this particular encephalic nerve and those of the spinal cord.

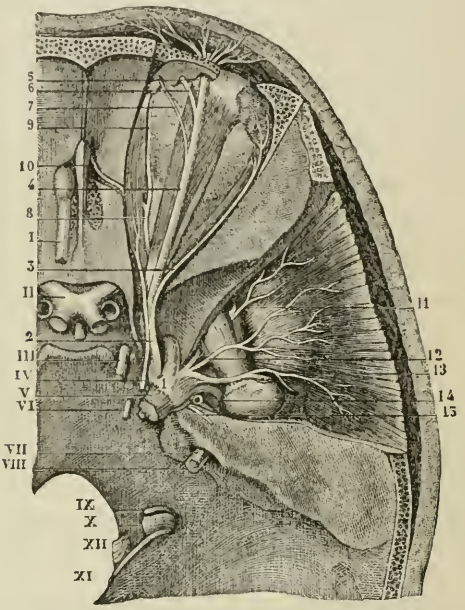
The fifth nerve is peculiar in being both compound and special: that is to say, it supplies parts with filaments of sensation, filaments of motion; and through one of its branches, called the "gustatory," with filaments which pertain to the sense of taste. It is the great sensitive nerve of the head and face; the nerve of motion to the muscles of mastication; the nerve of the sense of taste to the anterior part of the tongue. (See Function of Nerve.)

Immediately on the emergence of the roots from the points of their superficial origin, they pass through a slit-like opening in the dura mater at the apex of the petrous portion of the temporal bone. Here the larger root, called the sensor, enters a ganglion, lying in a fossa on the anterior face of this triangular apex, the Gasserian or semilunar.

The ganglion of Gasser is a small, reddish-gray semilunar knot enveloping apparently the great or posterior root of the fifth nerve

as it passes over the temporal apex; its size is equal perhaps to that of an ordinary buckshot, although from its flattened and crescentic form, the measurement from tip to tip of its horns would surpass somewhat the diameter of such a shot. The convex face of the ganglion looks forward.

FIG. 28.—TRIFACIAL DIVISION AND GANGLIA.



TRIFACIAL NERVE, the upper part of the orbit and temporal fossa removed. I, semilunar ganglion; 2, ophthalmic nerve; 3, lachrymal nerve; 4, frontal nerve; 5, 6, its two principal branches; 7, a branch passing from the orbital above the pulley of the superior oblique muscle; 8, nasal nerve; 9, its external nasal branch; 10, course of the internal nasal nerve from the orbit into the cranium, and nose; 11, 12, 13, temporal branches of the inferior maxillary nerve; 14, commencement of the auriculo-temporal nerve; 15, greater petrosal nerve. I, olfactory nerve; II, optic nerves; III, oculo-motor nerve; IV, pathetic nerve to the superior oblique muscle of the eye; V, trifacial nerve; its small root visible beneath the cut end of the large root, which forms the semilunar ganglion dividing into the ophthalmic, superior and inferior maxillary nerves; VI, abducent nerve; VII, facial, included in a groove of the auditory nerve, VIII, both entering the auditory meatus; IX, glossopharyngeal, X, pneumogastric, and XI, accessory nerves emerging at the jugular foramen; XII, hypoglossal nerve.

On emerging from this ganglion, the posterior root is found divided into three cords—the three primary divisions of the sensitive portion. The first of these cords constitutes what is called the ophthalmic nerve, or the ophthalmic portion or division of the fifth nerve. The second cord, the superior maxillary nerve, or superior

maxillary division of the fifth. The third, the inferior maxillary nerve.

The first of these nerves has its distribution over the orbito-frontal region.

The second has its distribution over the superior maxillary region.

The third associates with the lesser or motor root, which root first connects with it at the base of the skull, and has its distribution over the inferior maxillary region.

Ophthalmic Nerve.

This division of the fifth passes from the Gasserian ganglion along the outer wall of the cavernous sinus, and enters the orbit through the sphenoidal fissure; before entering which, however, it breaks up into three branches. These branches supply the eyeball, the lachrymal gland, the mucous lining of the nose, and the muscles and the integument of the forehead. They are called frontal, lachrymal, nasal. The ophthalmic is the smallest of the three divisions of the fifth. It is a flattened band not more than an inch in length, receiving, before breaking up into its terminal branches, filaments from the carotid plexus of the sympathetic, and giving off two or more filaments, which, with a branch from the fourth nerve, pass between the layers of the tentorium.

The *Frontal Branch* is the largest of the divisions of the ophthalmic, and is commonly regarded as the continuation of the nerve. In the orbit it lies above the levator palpebræ muscle, between it and the periosteum, dividing about midway of the cavity into two branches—supratrochlear and supraorbital.

The supratrochlear branch passes inward to the pulley of the superior oblique muscle, giving off here descending filaments which anastomose with similar trochlear filaments from the nasal nerve. A second or terminal branch passes from the orbit between the superior oblique and supraorbital foramen, ascends behind the corrugator supercilii and occipito-frontalis muscles, to both of which it distributes filaments, and is finally lost in the integument of the forehead.

The supraorbital branch or division of the frontal passes forward until it reaches the supraorbital foramen, when it passes out unto the forehead. In this situation it gives off a number of filaments to the upper eyelid, called palpebral. In its distribution over the fore-

head, it sends branches to the orbicularis palpebrarum, occipito-frontalis, and corrugator supercilii muscles, anastomosing in the first named muscles with filaments of the facial nerve. Other two sets of terminal filaments supply, the first, the periosteum covering the frontal and parietal bones; the second, the integument, as far back as the occiput.

The *Lachrymal.*—This is the smallest of the three divisions of the ophthalmic. It is almost always accompanied by filaments from the fourth nerve. In the orbit it connects itself with the orbital branch of the second or superior maxillary division of the fifth nerve. Its distribution is to the lachrymal gland, the conjunctiva, and the integument of the upper eyelid, in which last situation it joins with filaments of the facial nerve.

The *Nasal.*—This division is intermediate in size between the frontal and lachrymal. Entering the cavity of the orbit between the two heads of the external rectus, it passes directly across the optic nerve to the anterior of the ethmoidal foramina; through this foramen it passes into the cavity of the cranium, where it traverses the shallow groove on the front of the cribriform plate of the ethmoidal bone, until arriving at the nasal slit it passes directly downward into the nose, terminating in two branches. Of these two branches, the external descends on the inner surface of the nasal bone, supplying the mucous membrane of its neighborhood; leaving the cavity at the juncture of the bone with the lateral cartilage, it passes on the external part of the nose down to supply the integument of the lips, and join with the facial nerve. The second branch, the internal, supplies the mucous membrane about the front of the septum.

In the orbital cavity are given off three branches from the nasal—the ganglionic, ciliary, and infratrochlear.

The ganglionic is a slender cord, about half an inch in length, which is the sensor filament to the orbital or ophthalmic ganglion. (See *Ganglia.*)

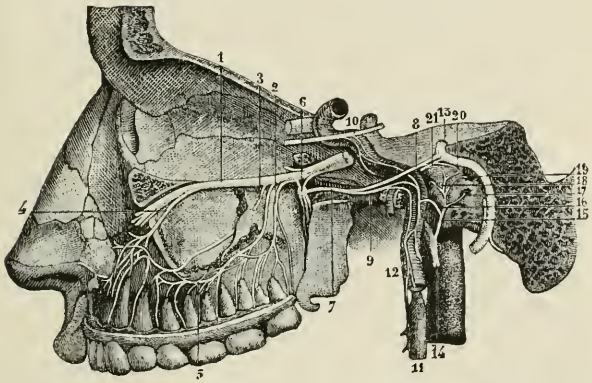
The ciliary, called long ciliary, to distinguish them from certain shorter branches, called also ciliary, given off from the ophthalmic ganglion, are two or three in number, and, in association with the short ciliary, pierces the posterior face of the sclerotic, and, passing between this coat and the choroid, are distributed to the ciliary muscle and iris.

The infratrochlear branch is given off just as the main portion passes into the ethmoid foramen, joining beneath the pulley of the

superior oblique muscle, with a filament of the supratrochlear nerve; this branch continues to the inner angle of the eye, where it is distributed to the orbicular muscle, the integument of the eyelid, and side of the nose, to the conjunctiva, caruncula lachrymalis and lachrymal sac.

Recapitulation.—The ophthalmic or first division of the fifth nerve supplies the tentorium, lachrymal gland, caruncula lachrymalis, lachrymal sac, ciliary muscle and iris, muscles of eyelid and forehead, integument of forehead and nose, mucous membrane of eye and nose, and pericranium of frontal and parietal regions.

FIG. 29.—SUPERIOR MAXILLARY NERVE.



THE EXTERNAL WALL OF THE LEFT ORBIT AND OF THE SUPERIOR MAXILLARY BONE REMOVED. 1, superior maxillary nerve in its course through the infraorbital canal; 2, 3, posterior dental nerves; 4, anterior dental nerve; 5, anastomosis between the dental nerves; 6, spheno-palatine ganglion; the branch from the superior maxillary nerve above is the commencement of the temporo-malar nerve; 7, pterygoid nerve; 8, greater petrosal nerve joining the facial nerve; 9, deep petrous nerve joining the carotid plexus of the sympathetic; 10, abducent nerve with its communicating branches of the latter plexus; 11, superior cervical ganglion; 12, ascending branches to the carotid plexus; 13, facial nerve; 14, glosso-pharyngeal nerve; 15, the tympanic nerve; 16, branch to the carotid plexus; 17, 18, 19, branches to the round and oval windows and Eustachian tube; 20, branch to the smaller petrosal nerve, 21.

This nerve or division arises, as a flattened band, from the middle of the Gasserian ganglion. It passes forward over the greater wing of the sphenoid bone, until, reaching the foramen rotundum, it leaves the cranium, and presents itself in the spheno-maxillary fossa; from this fossa it passes to the orbital cavity, through the spheno-maxillary fissure, where, being lodged in the infraorbital canal, it continues forward to the points of its ultimate distribution.

Branches of Distribution.—1. In the spheno-maxillary fossa—three in number—orbital, ganglionic, posterior dental.

The orbital enters, with the main branch of the nerve, the orbital cavity, and divides into two branches, temporal and malar. The temporal branch passes from the orbit through a foramen in the malar bone, and enters the temporal fossa; it here perforates the temporal muscle and fascia, and is distributed to the integument covering the side of the head, and associates with the facial nerve, and an ascending branch, auriculo-temporal, of the inferior maxillary. The malar branch leaves the orbit also through a foramen in the malar bone, perforates the orbicularis palpebrarum muscle, and joins with a branch of the facial.

Ganglionic, two in number.—They drop directly down into the spheno-palatine, or Meckel's ganglion; hence are commonly known as the spheno-palatine branches.

Posterior Dental.—This branch arises from the trunk just as it enters the orbit; it instantly breaks up into an anterior and posterior portion. The first supplies the gums and buccinator muscle; the second pierces the tuberosity of the maxillary bone, and, after forming a minute plexus above the alveolus, distributes filaments to each of the posterior teeth; its termination is lost in a union with the anterior dental nerve.

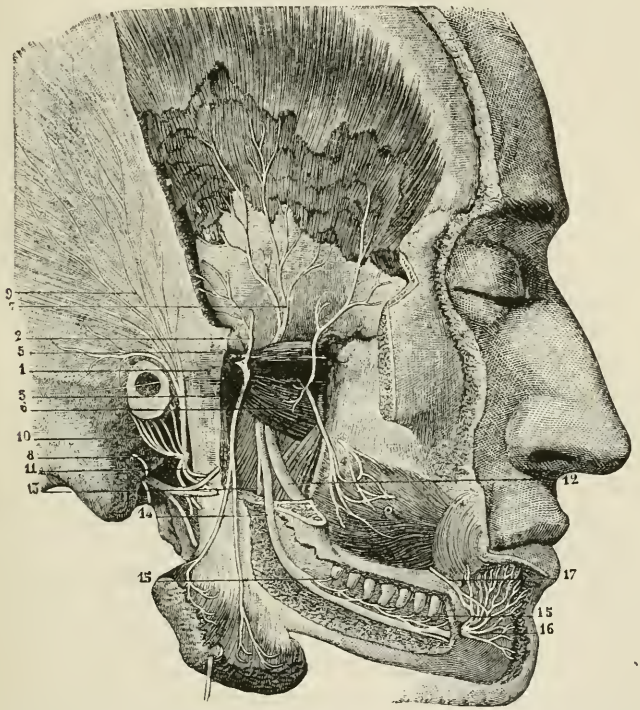
2. *In the Infraorbital Canal.*—One. The anterior dental. This branch is given off about midway of the canal. It enters a second canal existing on the anterior face of the maxillary sinus, and curving backward, associates itself, as above alluded to, with the posterior dental; from the curve are given off filaments to the anterior teeth—incisors, canines, and bicuspidati.

3. *On the Face.*—Three. Palpebral, nasal, labial. These are the terminal filaments, the division occurring as the nerve issues from the infraorbital foramen. The palpebral filaments pass up to the supply of the orbicularis palpebrarum muscle and the integument and conjunctiva of the lower eyelid; at the outer angle of the orbit they associate with the malar branch of the orbital and filaments of the facial nerve. The nasal filaments pass across the nose, supplying the muscles and integument of this region; they usually join at the tip with the nasal branch of the ophthalmic. The labial filaments pass downward beneath the levator labii superioris, and are distributed to the muscles and integument of the upper lip, to the mucous membrane of the mouth, and to the labial glands. The intricate plexus situated in the canine fossa is formed of filaments

from the facial nerve associating with twigs of the trimaxillary division.

Recapitulation.—The superior maxillary nerve, or second division of the fifth, supplies the integument on the side of the head, Meckel's ganglion with its sensor filaments, the teeth, the antrum, orbicularis palpebrarum muscle, integument and conjunctiva of lower eyelid, muscle and integument of nose, muscles, integument, and mucous membrane of superior lip and labial glands.

FIG. 30.—INFERIOR MAXILLARY NERVE.



DISTRIBUTION OF THE INFERIOR MAXILLARY NERVE. 1, muscular branch to the masseter muscle; 2, 5, 7, branches to the temporal muscle; 3, branch to the buccinator, anastomosing with one from the facial at 4; 6, external pterygoid muscle; 8, auriculo-temporal nerve; 9, branches to the temple; 10, branches to the ear; 11, its anastomosis with the facial; 12, lingual nerve; 13, branch to the mylo-hyoid muscle from the inferior dental nerve, 14; 15, branches to the teeth; 16, terminal branches to the lower lip and chin.

This nerve or division is the largest of the three, and constitutes, justly speaking, the only portion of the fifth nerve compound in character. The sensor portion is the third of the cords emerging

from the Gasserian ganglion; the motor portion is that lesser root alluded to as coming off from the pons Varolii; the sensor cord falls quickly into the oval foramen of the sphenoid bone, through which it passes from the cranium. The motor cord, which has passed forward beneath the Gasserian ganglion, unites with the sensor just as it emerges from this foramen. Here then is made, by this union, a single cord, the perfected or compound inferior maxillary nerve—a nerve made up of filaments of motion and filaments of sensation. At the point of juncture of these two cords is found a little ganglion, the otic. (See *Ganglia.*)

Immediately beneath the base of the skull, this compound inferior maxillary nerve divides into two branches—anterior and posterior. Into the anterior branch passes most of the motor filaments.

The anterior branch breaks up into five divisions, and is distributed to the muscles of mastication. These divisions or branches receive names from the parts supplied by them; they are the masseteric, buccal, deep temporal, and pterygoid.

The posterior branch is the larger of the two divisions; it subdivides into three parts. These supply the inferior teeth, tongue, and auriculo-temporal region. Hence the branches are named inferior dental, lingual, and auriculo-temporal.

Divisions of Anterior Branch. — *Masseteric.* — This branch runs across the sigmoid notch of the inferior maxillary bone, enters the substance of the masseter muscle, and is distributed in it. In crossing the notch it occasionally gives off a filament to the articulation.

Deep Temporal Branches.—They are two in number. They pass under the temporal muscle, and supply its deep surface.

Buccal.—This branch pierces the external pterygoid muscles, passes down beneath the coronoid process of the jaw, pierces the fibers of the temporal muscle, and, reaching the buccinator, divides upon it into a superior and inferior branch. The superior supplies the upper part of the muscle and the integument; the inferior supplies the lower part of the muscle and its lining mucous membrane.

Pterygoid Branches.—Two in number. One supplying each pterygoid muscle.

Divisions of Posterior Branch.—*Auriculo-Temporal.*—This branch passes out to the inner side of the temporo-maxillary articulation, turns upward in company with the temporal artery; and on emerging with this vessel from beneath the parotid gland, divides into two branches. The posterior of the two supplies the attrahens

auren, the pinna, and the neighboring integument. The anterior passes upward with the terminal branches of the artery, and is distributed to the temporal integument. Branches of communication exist between the auriculo-temporal nerve, the facial, and the otic ganglion. The articulation, the parotid gland, and the external auditory meatus receive nerve endowment from the auriculo-temporal.

Lingual or Gustatory.—This branch is a nerve of special sense, presiding in part over the action of taste; its terminal filaments, as might be inferred, are distributed extensively to the papillæ and mucous membrane of the tongue. Of the three sets of papillæ, the filiform and fungiform, or those situated on the anterior, two-thirds of the organ receive the principal supply, the posterior or great papillæ being supplied from the glosso-pharyngeal. On this account it was deduced that the gustatory presided over taste only as the anterior two-thirds of the tongue was concerned; and which inference has been abundantly borne out by vivisection. (See Todd and Bowman, *pages* 385, 86, 87, 88, 89, and 90.) In the dissection, the gustatory branch is seen coming off just opposite the sigmoid notch. In company with the inferior dental nerve, or branch, it passes down along the inner side of the ramus, until, leaving the dental somewhat above the posterior dental canal, it crosses obliquely to the side of the tongue, along which it pursues its way to its points of final termination, anastomosing at the tip of the organ with filaments of the hypoglossal. In its course it lies first beneath the external pterygoid muscle, crosses the internal pterygoid, rests upon the superior constrictor of the pharynx, runs over Wharton's duct, where it reaches the apex of the tongue. In its course, branches of communication are given off to the submaxillary ganglion and the hypoglossal nerve.

Inferior Dental Nerve or Branch.—This is the largest of the three divisions of the inferior maxillary nerve. Between its point of origin and entrance into the dental canal, it gives off a branch, the mylo-hyoid, distributed to the mylo-hyoid and anterior belly of the digastric muscles. The main portion, after entering the posterior foramen of the dental canal, pursues its way beneath the teeth, giving, in its course, filaments to all these organs, terminating finally in a branch, the mental, which passes from the canal at the mental foramen, and has its distribution in the muscular and cutaneous substance of the inferior lip.

Recapitulation.—The inferior maxillary nerve, or third division of

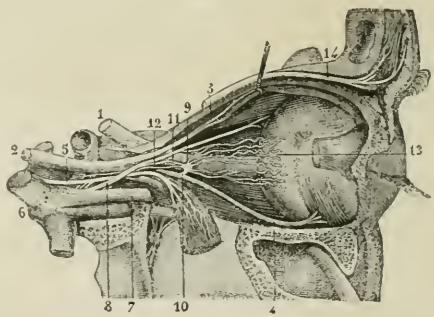
the fifth, supplies the muscles of mastication, the auriculo-temporal region, the anterior two-thirds of the tongue, the mylo-hyoid and digastric muscles, the inferior teeth, and the muscles and skin of the lower lip.

Ganglia of the Fifth Pair of Nerves.

Associated with the fifth nerve are six ganglia: they are called Gasserian; ophthalmic, lenticular or ciliary; Meckel's or sphenopalatine; naso-palatine or ganglion of Cloquet; otic; submaxillary.

Ganglion of Gasser.—This ganglion, called as frequently the semilunar, from its shape, is found lying in a slight depression on the anterior face, near the apex of the petrous portion of the temporal bone. It receives the posterior or sensor cord of the fifth nerve, and transmits it divided into three parts. The ganglion receives filaments from the carotid plexus of the sympathetic, and gives off filaments to the tentorium cerebelli, and to the dura mater of the middle fossa of the cranium.

Fig. 31.—Ophthalmic Ganglion—the Outer Part of the Right Orbit Removed.

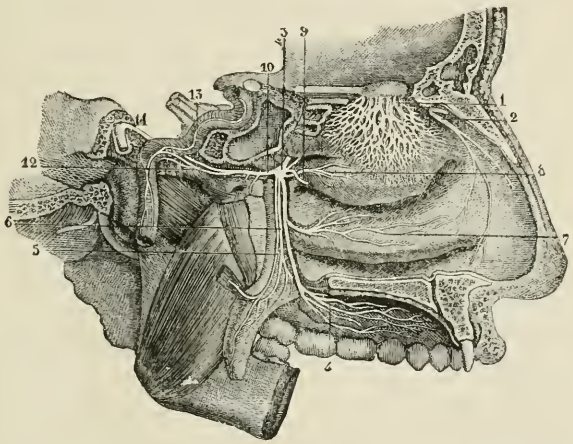


1, optic nerve; 2, oculo-motor nerve; 3, branch to the superior straight and oblique muscles; 4, branch to the inferior oblique muscle; 5, abducent nerve to the external straight muscle; 6, trifacial nerve, its ganglion and three principal branches; 7, ophthalmic nerve; 8, nasal nerve; 9, ophthalmic ganglion; 10, its communicating branch with the oculo-motor nerve; 11, do. with the ophthalmic nerve; 12, do. with the carotid plexus of the sympathetic; 13, the ciliary nerves; 14, frontal nerve.

Ophthalmic, Lenticular or Ciliary Ganglion.—This ganglion, as implied in its name, is found in the cavity of the orbit. It is a small, quadrangular, flattened body, not larger, generally, than the ordinary pin head; it is situated between the external rectus muscle and optic nerve, well enveloped in the mass of fat found occupying this portion

of the cavity. Its branches of communication are derived, the first, or sensor, from the nasal; the second, or motor, from the third nerve; the third, or sympathetic, from the cavernous plexus. Its branches of distribution are the short ciliary nerves. These nerves, ten or twelve in number, arise from the anterior face of the ganglion, being connected, as two sets of filaments, with the superior and inferior angles. The two sets pass forward, one being above, the other below the optic nerve, until, reaching the sclerotic coat of the eye, they penetrate this organ, and are distributed to the ciliary muscle and iris

FIG. 32.—VIEW OF THE SPHENO-PALATINE GANGLION, THE OUTER WALL OF THE LEFT NASAL CAVITY, AND THE OLFACTORY NERVE.



1, olfactory nerve; 2, nasal branch of the ophthalmic nerve; 3, spheno-palatine ganglion; 4. 5, 6, palatine nerves; 7, branch to the nose; 8, nasal nerve to the outer wall of the nose; 9, do. to the inner wall; 10, pterygoid nerve; 11, facial nerve; 12, deep petrous nerve joining the carotid plexus; 13, the other branch of the pterygoid is the larger petrosal nerve, which joins the facial.

Meckel's Ganglion—Spheno-Palatine.—This is the largest and most extensively connected of the cranial ganglia. Its position is in the spheno-maxillary fossa, immediately in front of the vidian foramen. In shape it is triangular, and in color reddish-gray. Its branches of communication are derived, the first, or sensor, from the superior maxillary nerve, which, as has been seen, gives to it two filaments while crossing the fossa. The second, or motor, from the facial nerve, or rather from the intumescentia gangliformis of that nerve. This branch is known as the great petrosal nerve; it emerges from the Fallopian canal through the hiatus Fallopii, passes along the

groove leading from this foramen, until, reaching the foramen lacerum basis cranii, it pierces the cartilaginous substance, filling up this osseous break, and entering the vidian canal, associated with the carotid nerve, passes forward under the name of vidian to the ganglion. The third, or sympathetic, is derived from the carotid plexus through the vidian.

The branches of distribution from this ganglion are numerous, and supply a portion of the orbital periosteum, the nares, the hard and soft palates, the half arches, the tonsil, the pharynx, etc.

The ascending branches, two or three in number, enter the orbit through the spheno-maxillary fissure, and supply the periosteum.

The descending, called palatine branches, are three in number; the anterior of these, or large palatine nerve, descends through the posterior palatine canal, passes along the groove on the hard palate, and is distributed to the gums, the mucous membrane, and palatine glands, anastomosing back of the incisor teeth with the naso-palatine nerve; while in the palatine canal, filaments are given off which pass to the middle and inferior turbinated bones.

The middle branch, called external palatine nerve, descends through the same canal as the preceding; it distributes its filaments to the soft palate, to the uvula, and the tonsil.

The posterior, called small palatine nerve, descends through the accessory palatine canal, and emerges back of the posterior palatine foramen. It is distributed to the levator palati muscles, the soft palate, tonsil, and uvula.

There are two sets of branches coming off from the internal surface; these are called superior nasal and naso-palatine.

The superior nasal, four or five in number, enter the nasal fossa by the spheno-palatine foramen; they supply the mucous membrane of the superior portion of the fossa.

The naso-palatine enters the fossa with the other nasal nerves, passes across the roof of the nose, until, reaching the septum, it descends between the periosteum and mucous membrane to the anterior palatine foramen; passing through this canal, it unites with its fellow of the opposite side, and distributes its filaments to the mucous membrane about the incisive fossa.

Naso-Palatine Ganglion or Ganglion of Cloquet.—This is simply the small swelling situated in the incisive fossa, the result apparently of the union of the naso-palatine nerves. The very name of ganglion is denied it by most writers.

Otic Ganglion.—This is an oval flattened body, of small size,

lying on the sensor portion of the inferior maxillary nerve, immediately beneath the oval foramen. Its branches of communication are, by sensor filaments with the auriculo-temporal nerve, by motor with the inferior maxillary nerve, and with the sympathetic by the plexus surrounding the middle meningeal artery. Branches of communication also exist with the glosso-pharyngeal, and through the medium of the lesser petrosal with the facial nerve.

The branches of distribution are two in number: one to the tensor tympani, and one to the tensor palati muscles.

Submaxillary Ganglion.—This is a small sized circular ganglion, situated upon the submaxillary gland. It is connected, through communicating branches, with the gustatory nerve, sensor; with the facial, through the medium of the chorda tympani, motor; and with the sympathetic by filaments from the plexus of the nervi molles.

The branches of distribution are five or six in number; they arise from the lower part of the ganglion, and supply the duct of the gland and mucous membrane of the floor of the mouth.

FUNCTION OF THE FIFTH NERVE.*

"The determination of the functions of the roots of spinal nerves has afforded the clew to that of the functions of the roots of the fifth nerve. The analogy of the smaller root of the fifth with the anterior spinal root, and of the larger one with the posterior spinal root has long been admitted by anatomists. Hence an analogy of function must be admitted, and the former must be viewed as consisting of motor fibers, the latter of sensitive ones; and by tracing each of the three great divisions of the nerve, we may determine its function by its constitution, according as it derives its fibers from either root or from both. The ophthalmic and superior maxillary are composed of fibers derived exclusively from the larger root; they are, therefore, sensitive nerves. The inferior maxillary consists of fibers derived from both roots, and consequently is both motor and sensitive. Sir C. Bell, in his original exposition of the functions of this nerve, fell into error from having neglected to avail himself of this method of analyzing the constitution of each of its three divisions, from which he would have seen that it is the inferior maxillary alone which derives its fibers from both roots, and which perfectly resembles a spinal nerve in constitution.

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* See Todd and Bowman.

"The distribution of the three divisions of the fifth nerve confirms most amply the view of its physiology suggested by the anatomy of its origin. The ophthalmic and superior maxillary are distributed entirely to sentient surfaces, or anastomose with motor nerves (the facial). They supply the skin of the forehead, of the eyelids, the conjunctiva, the eyeball, the mucous membrane of the nostrils, the integuments of the face, the upper lip, the nose, the beard on the upper lip, the integument of the ear, the temple, and the whiskers; they are the sensitive nerves to these regions. The inferior maxillary has two distinct sets of branches—the one by which the muscles of mastication are supplied; the other, which go to the integuments of the lower lip and chin, and the beard, and the mucous membrane of the mouth and tongue. This nerve is, therefore, the nerve of mastication, and of sensation to the surfaces above named.

"Repeated experiments in the hands of various physiologists, none of which, however, were more conclusive than those of Mayo, indicate the same views of function. Division of the ophthalmic or of the superior maxillary induced loss of sensibility without muscular paralysis, leaving only such an impairment of the motor power as destruction of the sensitive nerves invariably produces, by impairing the power of exact adjustment, for which a high degree of sensibility is necessary. But when the inferior maxillary nerve was cut, then both the power of mastication was destroyed on the same side, and the sensibility of the lower part of the face and tongue was lost. If the nerve were divided in the cranium, the whole side of the face and forehead, with the eyeball and nose, became insensible, and the muscles of mastication were paralyzed. Irritants might then be applied to the eyeball, without exciting winking, or causing pain, and strong stimulants might be introduced into the nostrils without creating the least irritation. When the trunk of the nerve within the cranium of an ass was irritated, the jaws closed with a snap from the excitation of the motor fibers, which are distributed to the muscles of mastication.

"The conclusions which we draw from anatomy and from experiment are confirmed by the histories of cases in which the fifth nerve had been diseased. In such instances we may observe the most marked separation of the motor and sensitive power, when the larger portion only or the two superior divisions of the nerve are affected, and we find both motion and sensation destroyed when the whole trunk of the nerve is involved in the disease. It is not uncommon in such cases to find the eyeball totally insensible to

every kind of stimulus, the nose quite unexcitable by the fumes of ammonia, or the most pungent vapors, and the mucous membrane of the mouth so insensible to the contact of foreign matters that a morsel of food will sometimes remain between the gum and the cheek until it has become decomposed. The insensibility of the eyeball exposes it to the permanent contact of irritating particles of dust, etc., which excite destructive inflammation of its textures. The whiskers may be pulled forcibly without sensation. The muscles of mastication become wasted and inert, as shown by the distinct depression in the regions of the masseter and temporal muscles, but the superficial muscles, on which the play of the features depends, preserve their natural condition.

"The fifth nerve may, therefore, be regarded as the motor nerve in mastication, and the sensitive nerve to that great surface, both internal and external, which belongs to the face and anterior part of the cranium. From its great size, and the large portion of the medulla oblongata with which it is connected, it may excite other nerves which are implanted in that center near to it. Thus it may be an excitor to the portio dura, as in winking; or to the respiratory nerves, as in dashing cold water in the face, or in sneezing. Its lingual portion distributed to the mucous membrane of the tongue is at once a nerve of taste, touch, and common sensibility, and its connection with the papillary structure of the red parts of the lips constitutes it a pre-eminently sensitive nerve of touch in those regions.

"The study of the pathological conditions of this nerve illustrates its physiology in a highly interesting manner. In the dentition of children, whether primary or secondary, it is always affected, more or less: and in excitable states of the nervous centers, the irritation of it consequent upon the pressure of the teeth often gives rise to convulsions, the brain and spinal cord being irritated; and we can often trace to such irritation, whether in infancy or in childhood, the foundation of epileptic seizures in subsequent years. Painful affections of the face (*neuralgia*) have their seat in this nerve; *tic douloureux*, for example. Many of the instances of painful affection of this nerve or of branches of it, which come under our observation, are well-marked examples of reflected sensation, the primary irritation being conveyed to the center by the vagus or the sympathetic from the stomach or intestinal canal. No one of these is so common as the pain over the brow, which so often follows derangement of stomach digestion; and which may frequently be instantaneously removed by taking away the source of irritation, as by neutralizing free

acid in the stomach. Frequently also the branches of this nerve, in greater or less number, on one or both sides, may, according to the humoral view, form a focus of attraction for a morbific matter generated in the blood, in persons exposed to the paludal poison, or in persons of rheumatic or gouty constitution; in these cases, as in most others of similar pathology, the neuralgia occurs in paroxysms of greater or less severity, each paroxysm being followed by a period of convalescence, which lasts, it may be supposed, until the morbid matter has been again accumulated in quantity sufficient to induce a high degree of irritation of the nerves."

CHAPTER IV.

DENTITION.

The direct and associative lesions of the teeth being so common and so many, the study of the diseases of the mouth will naturally commence with these organs.

In the fœtus of six weeks is to be observed, at the border of the palate, a groove occupying the position of the future teeth. This groove is called the primitive dental; scattered along the bottom of it are certain fine papillæ, which, in their development, are found gradually to assume the shape of the crowns of teeth. As these papillæ grow, the groove is converted into a series of distinct follicles for their accommodation by the growth of septi between each papilla, which septi soon begin to ossify, to assist in forming the bony sac or alveolus common to the perfected teeth. It is seen, however, that the septi complete only a circumferential boundary, the summit of the papilla being exposed. Before, however, the papilla has assumed the form of the tooth, the upper soft margin of the pit enlarges and falls over, forming an operculum or lid.

The tooth thus forming is generally regarded as a cutaneous production, and would seem to be a modification of the hair or nail. If such inference is an error, and this body is not entirely a cutaneous production, it is plainly enough seen that the papillæ, being submucous, enveloped, or overlain by the mucous membrane lining the primitive groove, must, in its development, either rupture this envelope, or assume and modify it. Now, what is the state of the case? According to the observations of Goodsir, and the opinion of Todd and Bowman, "the tooth papillæ must be regarded as homologous with, or answering to the tactile and hair papillæ of the skin, and it would therefore be expected that its main part would consist of a peculiar submucous tissue, covered by a homogeneous basement membrane, and surmounted by a tissue answering to the epithelium. The substance of the papillæ is, at first, a congeries of granular nuclei, dispersed irregularly through a firm, homogeneous, subgranular matrix or blastema, in which vessels and nerves are

by degrees developed. This is bounded by a definite transparent membrane, on which rests a reflection of the epithelium lining the sac, modified in structure so as to present a series of columnar, nucleated particles, the matrix of the future enamel." It would appear, according to these observers, that the lining and reflected layers of the epithelium become blended together, and constitute but one, which is more adherent to the sac than to the papilla; so that on opening the sac its walls generally seem unattached to the surface of the papilla, and the latter to be limited to what has been regarded as the basement membrane.

The growth of the papilla, thus circumstanced, is considered by these authors as follows: "Between the columnar epithelium lining the sac and the surface of the alveolar cavity, that is, apparently in the wall of the sac itself, is found a thick, semi-transparent, pulpy tissue, which has been termed the enamel pulp. It presents toward the pulp of the tooth—that is, toward the original papilla—a series of elevations and depressions precisely the reverse of those of the dentinal pulp on which they rest, and answering mutually to these, with only the columnar epithelium intervening. The structure of this pulpy tissue is elastic, spongy, loaded with fluid albumen, but destitute of vessels.

"In a vertical section of these parts, the enamel pulp is seen covered with columnar epithelium, the enamel matrix on the surface toward the dentinal or tooth pulp; while on the opposite surface the blood-vessels of the membrane lining the alveolus are seen coming up to and forming loops immediately under the enamel pulp, without penetrating it. It is further remarkable that short tubes, filled with glandular epithelium, descend among these vessels from the enamel pulp, and end by blind extremities. How these tubes, which are evidently glandular, can discharge their contents, it is difficult to understand, seeing they appear to open into the substance of the enamel pulp.

"The next stage* is that of ossification; and the earthy matter is first deposited in the homogeneous membrane forming the dentinal pulp. The most prominent portions of the crown are the first to harden; and the ossification proceeds inward by the gradual conversion of the pulp into the dentine or ivory. The nucleated particles of the pulp nearest the ossifying surface are found arranging themselves in series vertical to that surface; and it appears that, in order to

* Goodsir, Todd and Bowman, observations continued.

form these vertical series, they multiply by transverse division, much as those of bone cartilage are found to do. The earthy matters are then deposited in the indistinct cells surrounding the nuclei, so as to form the hard and dense walls of the dentinal tubes, as well as the intercellular substance, so as to form the intertubular tissue of the perfect tooth. The cells unite endwise, and their nuclei elongate and coalesce in a manner to constitute the cavities of the tubes, and so as often to retain this mode of origin in their permanent form.

"The calcification of the enamel commences on the surface of the dentine in contact with that primary osseous sheet formed from the basement membrane of the dentinal pulp. On this primary layer are minute shallow cups, closely aggregated, answering to the ends of the enamel columns and receiving them in a firmly cemented union, as the consolidation of the elementary cells proceeds. The enamel columns at a very early stage seem to consist only of a single series of nucleated particles, intervening between the dentine and enamel pulp. Those of the new row arrange themselves endwise on the others, which they resemble in all respects, so that the enamel attains its proper thickness rather by the superposition of particle or particles successively deposited, and by the subsequent calcification of each in its turn, than by the development of its parts by an interstitial increase; and thus it appears to differ from the dentinal pulp and to resemble the epithelium, to which it is allied.

"It is from that surface of the enamel pulp which looks toward the tooth that this successive development of new enamel columns proceeds; as they form, this tissue wastes; but it is not probable that the pulp is converted into the columns, as the dentinal pulp is converted into dentine, because the anatomical characters of the pulp are so dissimilar from those of the columns. When first calcified, the enamel rods are loosely aggregated, and easily separate from one another under pressure; but they gradually become so consolidated by the advance of the calcifying process in their interstices, as to make the finished enamel the most hard and indestructible of all the products of organization.

"The development of the layer containing the ordinary lucunæ of bone, and which in the human teeth covers the fang, and is continued a little way within the cavity of the root, does not seem to have been as accurately studied as that of the dentine and enamel. There can be little doubt that a membranous matrix, probably like that of the cranial bones, is laid down as the fang is developed, in which the usual steps of ossification precede the lacunæ and

their canaliculi, being formed from the corpuscles of the temporary matrix.

"When the ossification of the dentine is so far advanced that the tooth can sustain with impunity the pressure to which it is destined, and when the enamel is densely calcified, the eruptive stage occurs, in which the tooth makes its way through the gum. This is due to the same law of development which governs the form and position of other organs. The gum over the sac is absorbed, and the crown of the tooth is forced upward against it, chiefly by the increasing size of the fang below.

"As the development of the teeth proceeds, so does that of the alveoli: so that by the time the teeth break through the gums, their walls are sufficiently strong, and embrace the necks of the teeth with firmness enough to furnish a solid basis of support. Their vascular canals are developed, and especially those which convey to each tooth its interior supply of vessels and nerves. The gums and alveoli are likewise provided with vessels which play their part in the development and subsequent nutrition of the organs."

These are the views of development entertained by the authors above quoted. Investigations which I myself have made in the direction have seemed to simplify the matter very much, and, indeed, to deprive it of a very great share of its obscurity. Whether these views may be nearer right than the various others held, the reader may for himself determine.

At a certain period of fœtal life a groove is observed, the progressive development of which proves it to be the primitive dental groove. This groove is lined by a delicate membrane continuous with the mucous membrane, and perhaps a part of it—modified, but still a part of it, just as the conjunctival cells which pass over the cornea are really part and parcel of the common ocular conjunctiva. This membrane, at points corresponding with the position of future teeth, is elevated into papillæ or little hills. A section through the membrane, over any of the bulbs, exposes a papilla. This papilla or body, closely examined, is found to be made up of a congeries of granular nuclei, dispersed irregularly through a firm homogeneous blastema. This papilla is the rudiment of the future tooth, as observation of its development proves. It is not inclosed in a cell wall or membrane of its own, but is a kind of hyaloid structure or substance. The papilla, thus understood, is seen to lie beneath the mucous membrane; and in this membrane resides a certain amount of elasticity. As the papilla enlarges and projects itself, it becomes in-

closed to all the extent possible with this mucous membrane contracted about the body so as to constitute a sac or cell wall, just precisely as the parietal peritoneum contracts about and makes a sac to the projected intestine in hernia. This sac enveloping the papilla has its continuation, as is seen, necessarily over the sides of the groove; as then this groove enlarges and deepens, and finally envelops the papilla, it is seen that the body or tooth germ gets a second sac. It is as though one should envelop his head in a double night-cap, and then bind over this a handkerchief—the submucous structure of the lateral walls and operculum representing the handkerchief.

At this period, the pulp or original papilla having attained the size of the tooth it represents, commences the process of the formation of dentine. Before the attainment to full size of the papilla, there existed between it and its sac proper a halitus or fluid. This halitus, now that the congeries of cytoblasts or nucleated granules have obtained their full growth and secretive power, is replaced by a more highly endowed secretion, the work of these matured cells. This secretion, deposited against the inner sac, or between it and the pulp, contains the elements of the dentinal structure, is, indeed, the dentine, and deposits layer after layer, supported by and moulded into form by the sac.

As this deposit intrudes on the pulp, so this body contracts within itself, until, finally, by some law of nature, it stops at that certain point which maintains within the tooth a canal or cavity, and a vascular and nervous pulp to occupy it,—this pulp being the contracted original papilla; the vessels of this papilla being vessels entirely analogous to any one of the ordinary papilla of touch, so supplied and so maintained.

Why this secretion, in its organization, should assume the position of the elongated tubular cells which pertains to the structure of dentine, I have of course no idea, and it is quite enough for our purpose to say that it is a law of life perhaps never to be comprehended this side of eternity, and the discovery of which would, at any rate, have but little practical signification to us.

The formation of the dentine completed, the covering of it with enamel begins, or rather this deposit is, to a degree, coincident with the dentinal formation. Secreted by the same pulp which formed the dentine, the same secretion, some portion of it finds its way into and through the primary sac. As it passes through this sac it is modified, receives new elements, perhaps, which, as it is

received into the second space, or the space between the first and second caps, and its calcification commences, impresses upon it the arrangement of its particles after the hexagonal order of the enamel. Between the enamel thus formed and the dentine exists the primary sac; simply the originally modified mucous membrane, which we first saw as overlying the papilla. This membrane continues its existence between these two hard bodies, and receives and modifies, for the support of the enamel, the liquor sanguinis sucked out from the dentinal tubules and intertubular structure. It may be called the enamel membrane. It has of course been much modified, and it is from it that we receive the impressions of pain when it is exposed by a break in the continuity of enamel.

The growth of the root of the tooth, as its dentine is concerned, has precisely the history of the body. It is associated with the pyramidal elongation of the papilla or pulp, which, pushing upward the crown, elongates upon itself the enamel membrane. This elongation, with a greater vascularity and vitality assumed by the membrane as it approaches the basement vessels, modifies again the result obtained by the secretion passing through it from the dentinal pulp, the result being a nearer approach to true bone in the production of cementum. The periodonteum is simply the modified external sac, lost of course above the neck as the tooth has emerged through it.

This is a very simple and easily understood explanation of tooth growth. The observations leading to the conclusions were somewhat extensive, and, to my mind, the phenomena are indorsed by general physiological analogy.

We may pass here to what infinitely more concerns us as practitioners—namely, the relations of the first and second dentitions.

The teeth are divided into two sets or dentitions. The first is called the deciduous, milk or temporary, and consists of twenty teeth,—ten to each jaw. The second is called the permanent set, and consists of thirty-two teeth,—sixteen to each jaw. These various teeth, in size, density, and general character, are relative to the jaws containing them. The first set consists of eight incisors, four canines, and eight molars. The second set consists of eight incisors, four canines, eight premolars, and twelve molars.

Of the first set, the papillæ of the anterior molar appear first, the canine and incisors next, and the posterior molars last. About the fourth month these papillæ are all in their sacular envelopes, and forming behind the lids of the sacs are little crescentic depressions, called cavities of reserve, lined with mucous membrane, and con-

taining the germs of the papillæ of the second set of teeth,—one to each deciduous germ. The first molar of the permanent set is markedly related to the deciduous set, by having a common origin from and in the primitive dental groove; and from sacs, secondary to the capsule of this tooth, spring the reserve cavities of the second and third molars of the second set.

The eruption of the temporary set, although more or less irregular, ensues, as a rule, in the following order and time: the lower teeth erupt first—the four central incisors about the seventh month, the lateral incisors about the eighth month, the anterior molars about the thirteenth month, the canines about the sixteenth month, and the posterior molars about the twenty-fourth month. The period intervening between the first and last eruption is considered the critical period in infantile existence. (See chapter on Associated Lesions of First Dentition.)

The ossification of the permanent teeth commences, just before birth, with the anterior molars, proceeding forward, but terminating with the premolar at about the third year; the posterior molars are the last to ossify.

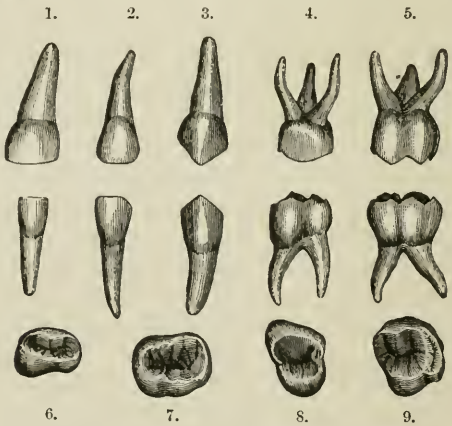
The position of the permanent papillæ, which at first are situated between the sacs of the deciduous and the gum, gradually recedes behind, falling deeper and deeper, at least, relatively so, as the milk set elongates, until, on the completion of growth in the deciduous, the germs of the permanent set are found in a common alveolus at the apices of these cavities, occupying, indeed, almost the position and physiological relations of the original papillæ.

At this point, whenever it may be, and it varies of course with different individuals, commences a process of antagonism,—it is intended that the new shall advance and increase, that the old shall decline and diminish. The relative position of the two bodies is as follows: extending to the apices of the alveoli, and receiving at these apices the principal vessels of nutrition, are the perfected roots of the first teeth. Crowding down into these alveoli, with nutritious vessels of their own, possessed with the high vitality of growing bodies, are the pulps of the second teeth,—it is the story repeated of the rootlet lifting the stone. As these pulps enlarge, so is there a corresponding enlargement in the alveoli containing them, until, finally, through such process of absorption they have fallen directly beneath the roots of the first set. Of course a pressure has been equally exerted upon these roots, and, as a result, the nutritious vessels passing into the pulp cavities, through the foramina at the

apices, have been gradually obliterated. But do the pulps of the milk teeth die? Not at all; or at least not necessarily. The neighboring vascularity is very great, the requirements of the organ very small; a sufficient supply is received from the circulation in the dentine, as well as from the periosteum, which, to the last, continues to close in the enlarging foramina. But this does occur: the absorbent or destructive system has been given the mastery, and little by little, day by day, and month by month, the roots of the first teeth disappear, while the crowns of the second advance, and occupy the space gained, until at length, as is witnessed every day, the milk tooth drops out of the cavity, minus a root, while the crown of the permanent is seen in its cavity.

If here we take up this thrown off tooth, we shall find that the pulp chamber, or what remains of it, instead of having an almost complete bony envelope, as is the case in the perfect organ, has communicated more and more largely, for a varying period, with the soft parts, guarding us, in such knowledge, against a treatment in aching milk teeth, at certain periods, which would be most applicable at others.

FIG. 33.—GENERAL APPEARANCE OF THE FIRST SET OR MILK TEETH.



TEMPORARY TEETH OF ONE SIDE. 1, 2, upper and lower incisors; 3, upper and lower canine; 4, 5, upper and lower molars; 6, 7, triturating surface of the lower molars; 8, 9, triturating surface of the upper molars.

To judge of the condition of the foramina of the first teeth, we compare them with periods of eruption of the second, recognizing that the enlargement or absorption corresponds with such advance in the permanent.

The first teeth of the second set erupt entirely back of the temporary, and in no way interfere with them. These are the anterior or first molars, and appear commonly at about the sixth year, seldom earlier, but not unfrequently from one to several months later; the sixth year, however, is the rule. The second teeth to appear are the central incisors, the lower a little in advance of the upper—about the seventh year; the third, the lateral incisors, at the eighth year; the fourth, the anterior premolars, at the ninth year; the fifth, the posterior premolars, at the tenth year; the sixth, the canine or cuspidati, at the eleventh year; the seventh, the second molars, at the twelfth year; and the last, the third molars or wisdom teeth, at a period varying from the seventeenth to the twenty-fifth year—more commonly, however, about the eighteenth year.

CHAPTER V.

ASSOCIATIVE LESIONS OF FIRST DENTITION.

Although it comes not strictly within the province of a work on surgery to treat of the associative lesions of the first dentition, yet it would seem that such a work could not be at all complete without, at least, reasonable reference to such conditions.

When one considers the delicate and susceptible organism of an infant human being, and the fact of its usherance into a world where active causes of disease are in constant antagonism to it, he is very well prepared to understand that in the influences of the process of dentition must necessarily exist a powerful predisposing cause inviting to attack, and, indeed, opening the portals, as it were, to enemies that otherwise might have passed harmlessly by.

The calculations of Dr. Arbuthnot that, at this period, one in every ten children has its life destroyed through the associative and influenced lesions of the age, may, perhaps, not be strictly in accordance with statistics at large; but the mortality is so alarmingly great that, to the general practitioner, no subject offers in its study more important and vital interests.

In the first place, we have to remark that the process of dentition, while a physiological one, is yet, like that of utero-gestation, one of continuous irritation. Of the meaning of this word irritation, every surgeon and every physician has in his mind full quite enough reminiscences. Irritation, then, is the matter of consideration in all and every of these associative lesions; if happily, in such cases, we could exactly appreciate and exactly control such irritations, we should of course abort or resolve the results.

It is not, however, by any means to be esteemed that all infantile diseases are influenced by, or indeed even remotely associated with, dentition: mistakes of such nature are quite too frequently made, and infants are tortured, and in many cases have the existing disease aggravated, by the lancing and cutting which follow. It is very true that irritation from this cause has not always an associated external local manifestation; but such manifestation is, I think,

much more frequently to be found present than absent,—at any rate, it should always have its full share in the diagnosis. It will of course be taken for granted that dental irritation is influenced to a most marked extent, all things being equal, by the slowness or rapidity of the evolution of the teeth. Thus, such equality existing, we would not anticipate from the eruption of a single tooth the trouble of five or six, and such a difference in evolution is so marked that it may be said of some children that they cut their teeth in mass, while with others it is a process of the greatest regularity and harmony. Again, the physical condition and age of the child are matters not without much significance. A delicate infant suffers more, as a general thing, than a robust one, while premature dentitions are attended with more danger than late ones. In taking into consideration the influences of this process, we are not to forget either the varying degrees of susceptibility, as manifested in different individuals, as thus we are led to appreciate the fact that judgment is not to be founded alone upon the extent or degree of local manifestation. Some children are preternaturally susceptible to stimuli, and these are not at all necessarily of the weak and feeble class; others, on the contrary, are so obtuse, even from earliest age, as to be very little influenced by any ordinary or common cause of irritation.

To the experienced physician, the appreciation of associated or abstract dental irritation should not be a matter of difficulty. He sees and he does what is to be done, what only can be done; if the treatment fails, the fault resides not in the practice. In the first place, to understand dental irritation, one must be familiar with dental evolution; this of course is the understanding of the physiology of the subject. We know the varying periods of eruption, and we are thus at once led very direct in our researches. If we find a source of offense, as manifested by a tumid, congested gum, we have only to pass a lancet down to the confined tooth, and having done this, we may expect and hope for relief from any general trouble which has been engendered by the just liberated organ. If we look into the mouth, and see no manifestations of offense, it is generally the case that dentition has nothing to do with a trouble which may have influenced the search,—not always, however, for I have inferred that dentition may be a source of reflected trouble, while itself presenting no local signs. Still, such cases are very rare, and when existing depend on great rapidity in evolution, either as a single tooth is concerned or the simultaneous advancement of a number. Many teeth, rapidly advancing at the same time, could very well

be esteemed as a source of constitutional offense, not only as diverting in such direction an excess of the vital force, but also in local irritations induced in neighboring structures, and which might not at all be evident by any external signs. In these latter cases, the physician can do nothing but increase, by indicated means, the ability of the system to endure the irritation; such means being more frequently found in tonics than in sedatives. In the weak, strict attention is to be given to diet, to exercise, and cleanliness. The character of the clothing is also of much consequence. If the milk of the mother is not properly nutritious, other means are to be taken to nourish the child.

In cases where there seems simply an excess of irritability, such susceptibility is to be lowered by the withdrawal of any and everything capable of fostering it; this will pertain to the lodgment of the child, food, drink, clothing, exercise, etc., matters which would at once strike the observing practitioner.

Disturbance provoked in the alimentary canal, and fever induced through the process of teething, when existing conjointly with acute disease, of whatever character, necessarily aggravate such disease, and increase by just that much the attending discomfort or danger; hence the recognized increased mortality in the exanthemata occurring at this period.

The diseases, if they may be so called, directly associated with and dependent on abnormal dentition, and having therefore necessarily their cure more or less intimately associated with the correction of the primary lesion, are—

1st. Localized Stomatitis.
2d. Irritative Fever.
3d. Diarrhœa.
4th. Spasms.
5th. Eruptions on the Skin, especially the Scalp and Face.

1. *Localized Stomatitis.*—The first indication in this condition, dependent on advancing tooth eruption, consists, most likely, in a sense of titillation or itching,—as, before any local sign is visible, the child is found irritating the parts with anything coming into its hands, seeming most comfortable when biting upon hard substances. Slavering is also associated with this stage. After a time tumefaction of the gums is observed, and this inflammatory action circumscribes or extends itself on the same principle as the vaccine disease —that is, as influenced by constitutional or local circumstances. If several teeth are attempting eruption at the same time, and these

are situated at opposite sides of the cavity, then the probability is that the inflammation will be a diffused one. If, on the contrary, the irritation is confined to a single tooth, and there is in the habits of the child no particular inflammatory tendency, then it may reasonably be anticipated that the area of congestion will be very circumscribed. The shape and extent of face in the erupting tooth have not seemed to me to have as much to do with the amount of irritation as one would naturally infer to be the case. I have certainly seen quite as much trouble from an erupting incisor as in the case of a four-cusped molar. Bad and degenerating inflammations are always associated with constitutional conditions. Thus in scrofulous children, it is sometimes the case that a semi-gangrenous ulceration is the result of cutting a tooth which it is quite troublesome enough to manage; while in children of a syphilitic cachexia such a condition will be even aggravated, the gums and continuity of mucous membrane looking as if it was impossible to keep the parts from breaking down into general ulceration. When tumefaction of the gum is dependent on tooth eruption, and the child is of healthy condition, a certain evidence is found in the glistening character of the swelling: the part immediately over the tooth or teeth looks stretched and feverish. This tense look is nearly always present, and may, under all circumstances, be esteemed an indication demanding the use of the lancet. In unhealthy conditions, this glistening is not commonly present, its absence being dependent on the flaccid, relaxed condition of the gum tissue. Here, as implied, the congestion is of more diffused character; the part and associate parts are turgid and soft looking. You esteem, in looking into the mouth, that scarification would be of service, but that it is demanded for a sense of general relief, rather than for a strictly acute local condition. Lancing in the first of these cases, if properly performed, yields an almost instantaneously good result; in the second, such relief is gradual, and most likely inconsiderable. In the first, it is all-sufficient to the cure; in the second, the constitutional indications are soon felt to be of much more consequence than any local requirements.

To lance the gums of a child, let the surgeon seat himself directly in front of the nurse, the height of the knees of the two parties corresponding. Let the nurse now take the child on her lap, supporting its whole body, excepting the shoulders and head, which are to rest upon the knees of the operator. In this position the nurse controls perfectly the legs and arms of the infant, while the surgeon has complete command of its head, and can examine and operate upon

its mouth at his convenience. The face of the child should look toward the window, or if night is the time of operation, a candle or lamp will be found all-sufficient.

A tooth should be lanced in consideration of its shape. Thus, if it be any of the anterior six teeth, either of the upper or lower jaw, a single incision made sufficiently deep to feel the lancet strike upon the enamel is all that is required. This incision should be made across the mouth, or on the line of the cutting edge of these teeth, as we find them in our own mouth. With the posterior teeth, the crucial form of incision is demanded: such form will alone relieve the advancing cusps, and affords the result desired.

Concerning hemorrhage, it has not been my experience that any special danger is to be apprehended. I certainly never hesitated to lance the gums of a child on this score, and never met with a case that gave me any particular trouble. In ordinary cases, the loss of a little blood is rather to be desired than otherwise, while if a hemorrhagic diathesis exists, the local application of strong alum-water or of bayberry powder will generally be found all-sufficient for its control. A little cobweb, as found in the cellar, wet with borax-water, and then dipped in the bayberry powder, will in ninety cases out of the hundred not fail to control the bleeding, when laid over the incision,—the application to be secured by passing over it, if necessary, one layer of a delicate roller.

A constitutional medicament, of great effect in these cases, will be found in the Erigeron Canadense. One drop of the tincture to be given in a little water, each minute, until the bleeding ceases, or until twenty or thirty drops are taken. Opium and lead act very happily in combination. The dose of each must of course be small. A very good formula would be as follows:

℞.—Pulv. opii, gr. ¼;
Plumbi acet. gr. i;
Aqua, ℥iij. M.
Sig. Teaspoonful to be taken each half hour, p. r. n.

Touching a bleeding gum with Monsel's solutions, or with nitrate of silver, is, in my experience, dangerous practice. The only alarming cases of hemorrhages I have ever seen have been the results of such applications. It is true that such effects may rest rather with the operator than with the agents; but it is seldom that one seems to succeed in using them with sufficient cleverness and localization. They are certainly much more apt to do a great

deal of harm than any reliable good; secondary hemorrhages are common to them, and which are always of a character much more difficult to manage than the primary trouble.

Another matter in this connection particularly worthy of note, is the influence on the hemorrhage through the sucking propensity of the child. This is to be obviated by passing a roll of rubber or other convenient material across the mouth, and so confining it as while it shall not fret the little patient, it will destroy the ability to make a vacuum This manipulation is very simple and easy of accomplishment. The ordinary soft india-rubber ring may be cut in the middle; tie a piece of string or tape to either end, pass the rubber across the mouth, and fix the tapes on the back of the neck; an hour or two will be found quite sufficient to retain the apparatus in the mouth.

Cases of localized stomatitis, having association with the strumous, scorbutic, or syphilitic cachexia, require, as suggested, a treatment external to the cause exciting it; the child must be built up; the inflammation passing quickly into an adynamic type demands for its cure stimulation rather than depression; or, to express the requirements more justly and explicitly, a local treatment must be quieting and perhaps refrigerating, while tonics, combined with the mineral acids, will be required constitutionally.

A child eight years of age, of marked scrofulous condition, tissues relaxed, abdomen pendant, was presented at one of my clinics, suffering with trouble in the oral cavity. Making an examination, the mucous membrane of the palatine aspect of the superior jaw was found angry and uncomfortable looking, no tension at any point, but the whole membrane turgid, and yet flaccid looking. In searching for the cause of trouble, the age of the patient directed a first attention to the position of the first bicuspid teeth, the lateral incisors being erupted and in position; exploration with the lancet—the deciduous molars had been removed long before—revealed these teeth on either side, with the second bicuspid of the right side nearly ready to erupt. The ordinary crucial incisions were then made. In the case of a healthy child, this would have been all-sufficient; with such a child, however, not so. Relief from the incision will certainly, to some extent, be obtained; but the congestion will continue, and it may be will grow worse, the parts seeming to lack that energy necessary to the restoration. In this particular case, and which is here noted merely as a type, the mouth was ordered to be washed three times each day with very dilute

brandy and aromatic sulphuric acid. Internally, lemonade was given each two hours, five drops of brandy to each wineglassful. Aromatic sulphuric acid acts very happily in these and similar cases, or the nitromuriatic acid may be administered in from two- to five-drop doses, three or four times a day. Iron, combined with an acid, as in the Tinctura Ferri Chloridi, is a most admirable medicine, given in from five- to eight-drop doses, three times a day. It is found also not unfrequently necessary in these cases to bring the acid, in a more concentrated form, directly to bear upon some obstinate point of ulceration; this is done very readily by means of a pine stick. Dip the point into the acid used, and employ concentrated or dilute according to the seeming requirements of the case. The acid nitrate of mercury so applied is found sometimes to act very happily, or the deliqueseed chloride of zinc may be used. The zinc, followed by a brush of the officinal tincture of iodine, will sometimes induce granulation as if by magic; or the iodine combined with creasote may be employed with every hope of success.

In syphilitic stomatitis, specific treatment must be conjoined with the supporting. A combination that I use with the most satisfactory effect is as follows:

℞.—Hydrarg. bichl. gr. i;
Potass. iod. ʒi;
Syrupus ferri pyrophos. ʒiv. M.

Sig. From a quarter to half teaspoonful, according to age, three times a day.

It not unfrequently happens, however, that a treatment which has preceded ours has been too free in the exhibition of the mercurials; here the medicine is not to be longer used, but, conjoined with the supporting treatment, we are to employ the chlorate of potash.

℞.—Potassæ chloras, ʒss;
Aqua, ʒviii. M.

S. Teaspoonful, internally, four to six times a day, and the mouth to be washed with the same, ad libitum.

In all adynamic conditions of childhood, it is, I presume, a common experience that no better treatment is to be found than lies in the observance of general hygienic laws. The food must be nourishing, and not given to repletion. Fresh air and exercise are necessities. The child should sleep by itself, or, what, as it is con-

cerned, is even better, it might sleep with some young person of more robust and healthy condition. The daily use of the salt-sheet bath, with the water tepid or cold, according to the ability of the patient to bear. This is an invaluable adjunct to restoration. Throw the wet sheet quickly about the person of the child, and rub until a fine glowing reaction sets in. In the use of this means, however, close attention is to be given to the daily result. If reaction is not secured, but the child seems cold, and the cutaneous capillaries contract, then such bath is to be discontinued; or if the cold water has been used, it must be modified, even perhaps to absolute warmness. A good plan to adopt with this bath, is to commence with milk-warm water, and advance with gradations to cold.

All the functions of a child of scrofulous or syphilitic condition are to be carefully attended to. If the bowels are habitually costive, as is very frequently the case, olive oil of good quality may be administered q. s. This oil not only obviates such a condition, but acts as a most desirable article of nutrition. If given alone, a teaspoonful or dessertspoonful, each day, administered at any convenient period, will generally be found sufficient,—and, indeed, in many cases, too laxative. If the child is of an age to take the oil mixed with other food, much attention to the quantity employed will not be found of special consequence. In cases where the kidneys fail to eliminate with sufficient rapidity, small doses of sweet spirits of nitre may be exhibited. Buchu, where there is undue irritability of the urinary apparatus, will be found to apply very happily. A prescription which I very frequently make, is as follows:

R.—Take of buchu one ounce; add one and one-half pints of hot water, and simmer down to one pint; when cold, strain, and give in teaspoonful doses, four or six times a day, p. r. n.

Particular attention is also demanded to the state of the skin. It should feel soft, not relaxed, moist, and reasonably oily; it must be kept very clean, but not washed too frequently with soap. Whisky or brandy, where stimulation seems indicated, may be added to the water with which a child is bathed; but a healthy skin is to be made rather from within outward, than from without inward—that is to say, a skin which does not perform properly its offices, indicates, as a general thing, some derangement ulterior to itself, so that the local attention implied is never to be esteemed but as adjunct treatment. It has not unfrequently happened to me to observe that a stomatitis, having apparently a local signification, has immediately disappeared

upon the correction of a trouble existing in the skin. This is markedly seen in the retrograde exanthems.

Angina simplex, a simple inflammation of the fauces, is not unfrequently dependent on irritations existing or having origin in the oral cavity. Here the trouble is simply one of continuity, and its cure is found of course in the cure of the oral trouble. Angina simplex, or the extension of the oral inflammation, is generally first made evident in difficulty of swallowing. Examination reveals the throat red and engorged, the degree being influenced by the condition of the patient. Sometimes this congestion is so great as to make the act of deglutition an impossibility; even fluids taken into the throat will be ejected through the nostrils. The uvula occasionally will be enlarged to an extent, as the result of effusion into its cellular structure, which seriously endangers the respiration of the patient, compelling, indeed, in many cases, the amputation of the organ. In some instances aphthous patches appear upon various parts of the mucous membrane; these denote that the inflammation is adynamic in its type, and are, I think, always a matter for concern, just, indeed, as a phagedenic chancre is a cause for more alarm than a simple sore, implying absence of vital force and degenerative tendency. An aphthous ulcer is a patch of yellow exudate, frequently excavated, but not necessarily so. It is the form of ulceration and exudation so frequently seen in weakly, broken-down women. The microscope exhibits the aphthous exudate as a fungous growth; it has, however, as yet failed in designating its specific. Angina simplex, it has been remarked, when dependent on any oral trouble, may be expected to retire upon the removal of the immediate cause. This, however, is not always the case, as witnessed in the adynamic types, or in children of very full or sanguine temperaments. In these cases, a treatment must be pursued as implied in the indications. If the continuance of the inflammation depends upon the surcharged conditions of the vessels, a general or local depletion will be found demanded. Three or four Swedish, or twice as many American leeches, may be put upon the upper part of the neck; the number to be graduated to the strength of the patient and the urgency of the case. A treatment preliminary to this, and one which in my own practice I always employ, when the case is not especially urgent, consists in reducing the volume of blood, either by the administration of diaphoretics or the saline cathartics. Epsom salts, a teaspoonful in a wineglass of water, will carry much fluid from the blood of a young child; or the spirits of Min-

dererus—covering the patient warmly until diaphoresis is produced —given in teaspoonful doses, every ten minutes, will be found to sometimes very quickly break up such inflammations Hot pediluvia are not to be neglected; the feet and legs of the little patient, kept in hot water for the space of a quarter of an hour, will, in very many cases, be all-sufficient for a cure. A less speedy, but frequently very successful way of treating angina, consists in diverting, as it were, the seat of irritation; thus, by the administration of nitre we may send it to the kidneys, or with tarter emetic we can throw it upon the skin.

℞.—Spts. ammoniæ aromat.
Spts. æth. nit. āā ℥ss. M.

S. Give from five drops to a teaspoonful, according to age, every three or four hours.

The ammonia in the above prescription drives the congested blood forward, while the nitre directs it toward the kidneys.

In cases in which the circulation is deficient in the cutaneous capillaries, as indicated by their diminished caliber, small doses of antimony answer an admirable end. This treatment may be conjoined with one of the salts of morphia, or the two together may be given in the Hoffmann's anodyne mixture.

An emetic will not unfrequently break up a sthenic sore throat. In the case of children syrup of ipecacuanha answers every purpose. It may be given in doses varying from a half to a full teaspoonful, according to age, every ten or fifteen minutes, until the desired result of emesis is obtained.

If, conjoined with the local inflammation, we have a sympathizing by the system at large, as manifested in fever, febrifuges are to be employed. The following combination will be found happily adapted to such indications:

℞.—Liq. potassæ citrat. ℥iij;
Spts. æth. nit. ℥ss;
Ant. et potass. tart.
Morph. acet. āā gr. i. M.

Of this mixture the dose for an adult would be a dessertspoonful every two hours; for an infant, one year of age, from five to eight drops might be given, being diminished or increased according to effect. Overdoses produce sick stomach.

Diet.—This should of course be light, as in all sthenic inflammations. The child may be limited to the breast alone; or if age or circumstances will not permit of this, gum-water, or other light and unstimulating food, should be alone employed—that is to say, should be alone employed while the grade of the inflammation is running upward. Ice-cream is an admirable food, particularly when eaten slowly, and, I may say, continuously. By continuously, however, I do not mean that great quantities are to be taken, but a reasonable portion be made to last as long as possible. Eaten in this way, it is refrigerant not only to the inflamed part over which it necessarily passes, but to the system at large, lowering the heat of the whole body, and thus quieting the disturbed circulation.

Chronic Angina.—Inflammation of the fauces, running into a chronic condition in children, may perhaps always be esteemed as depending on some constitutional predisposition. In these cases the glandular bodies seem to be most markedly the seat of trouble. Granulations are generally prominent over the mucous membrane, this tissue being covered with a mucoid or muco-purulent secretion. Ulcers are very common, and not unfrequently are of such degenerative tendency as to threaten the continuity of the parts. A disagreeable association, connected nearly always with a neglected angina, is the chronic enlargement of the tonsil glands. I have been compelled to operate in these cases, as every slight cold would so swell up these bodies as to render respiration almost as difficult as in asthma. I have just now under treatment a little girl, in whom, from this cause, these glands are so enlarged that respiration during sleep is accomplished only by an effort that it is absolutely painful to listen to. Of course the case is curable by excision; but to this neither parent nor child can be brought to submit. The sense of tickling and rawness in the throat, in chronic angina, is another source of discomfort; the patient is constantly kept coughing and hawking. This is induced not unfrequently through the dryness of the membrane, and again as a result of the irritating nature of the secretions, or it may be dependent on ulceration. From whatever cause induced, however, I have never found anything better adapted to its temporary relief than gum arabic held in the mouth and allowed slowly to dissolve. Difficulty in hearing is another frequent association of chronic angina,—the explanation being found in the inflammatory thickening of the Eustachian tube. Pain in the act of swallowing is the result of a lymph exudate n the submucous cellular tissue. This it is which gives the

irregular thickening so observable about the posterior wall of the pharynx.

Chronic angina, if not dependent on any specific constitutional conditions, would be most rationally treated by stimulation, local or general, or both, as would seem to be indicated. The ordinary domestic remedy of a red-pepper gargle, if judiciously used, would not unfrequently produce a speedy cure. Unhappily, however, domestic medication is too apt to be carried to excess, and thus adds to, in place of subverting, a disease. If a true, uncomplicated chronic angina presents in a child, and it will not do to deny but what such cases may exist, let the patient first be treated with a wash compounded as follows:

R.—Tinct. capsicum comp. ℥ss;
Aqua, ℥viij. M.

If a few applications of this gargle should not effect a change, let nitrate of silver be added, in proportion of one-half a grain to the ounce. If even this should not result in the desired change, then it will be well to esteem that a general medication is indicated. First we may set about to correct any functional disturbances that may be present, and follow such corrections with tonics. Muriated tincture of iron is an admirable medicine, where the system seems to require building up; quinine, in the majority of cases, may be given in addition, with a very happy effect.

R.—Tinct. ferri chl. ℥iij;
Quiniæ sulph. gr. x. M.

S. To be taken in from three- to ten-drop doses, three times a day.

Where treatment, as just indicated, shall fail, alterative medicaments of the various classes may be tried,—alum-water, tinct. iodinii, weak dilutions of creasote, acid nitrate of mercury, chloride of zinc, solutions of lead, etc. Constitutional vices must receive full share of attention. I have presumed to imply that in children affected with chronic angina the cause is always found to exist in this direction. Scrofula is by far the most common of these vices. A scrofulous child is liable to almost any description of physical degeneration. Now scrofulous degeneration is rather a difficult thing to describe, the conditions are so diversified and varied. A child descended from consumptive parents is degenerate,—it is not amiss to say scrofulous. A scrofulous child has not necessarily a special

distinctive type. It may, for example, have white, delicate skin, tumid abdomen, non-compact, pouting lip, and the languid, listless gait. It may have every belonging of the most marked lymphatic temperament; or, on the other hand, a scrofulous patient may look as if possessed of all the characters of a vigorous constitution. I do not know what better to do, in cases of this kind, than to make a general observation of antecedent and present conditions, and found a treatment accordingly. Syphilis, it has been inferred by some writers, lies closely, or away back in the distance, as the root of such conditions; but if such should be the case, a treatment anti-syphilitic is not necessarily implied. This peculiar vice may have lost itself in a general degenerative condition, just as an injury, which has of itself gotten well, may yet be the cause of broken health and physical adversity,—just, indeed, as phthisis may succeed syphilis, long since inferred to have been cured. In all such cases we can only hope, in the correction of ill conditions recognized as existing, to find the good we require. We may philosophize and reason, but if nothing functionally wrong is perceived, we must have recourse to a somewhat empirical treatment, building, as we say, the patient up. In other words, there are no specific means of cure; therefore we resort to such general tonics as experience has demonstrated to be useful. Cod-liver oil, administered daily, cream, mixtures of spermaceti and milk, preparations of iron, infusions or tinctures of the bitter barks, as the Peruvian, serpentaria, etc., are medicines to be employed in these cases.

2. *Irritative Fever.*—Irritative fever, or fever from the irritation of teething, is a direction of infantile trouble very frequently demanding the attention of the physician. It may not be amiss, for the benefit of the student, to remark that by irritative fever we mean fever the result of something that produces overexcitement. This, it is true, would also be a definition of inflammatory fever, the two conditions being really one and the same, except in degree. Now the irritative fever of dentition is, as a rule, a rapid fever—that is, it appears and disappears quickly; the lancing of a gum causing it very frequently almost instantly to vanish: not always, however, for it can readily be understood that such a disturbance of the functional conditions could be excited as to make a return to an equilibrium much less probable than production of some organic change.

All febrile conditions in children of a sthenic type are attended with much restlessness; but the fever of dentition is markedly so. Muscular excitability is a prominent association; the sleep is broken;

thirst is very great; appetite impaired and irregular, the child taking the breast rather for the relief obtained from the moisture of the milk than from desire for food; the pulse is not unfrequently driven to an incredible rapidity; the face is flushed and burning; the eyes congested and protruded. Convulsions, and not unfrequently death, mark the climax.

The disturbance effected in the system, as has been remarked, will be found, most likely, in proportion to the local irritation, and the age, constitution, and general condition of the patient. The marked mobility existing in the nervous structure of infants renders the brain peculiarly susceptible; it is therefore a most common association to find the feverish infant flighty, and perhaps entirely out of its head; while if febrile disturbance, consequent upon dentition, supervenes, when other diseases are in progress, such diseases will be commonly much intensified.

The diagnosis of dental irritative fever is not always an easy matter, and simply because the fever is irritative, and not invariably inflammatory—that is to say, the local disturbance is confined to the nervous structures, and does not involve, to a perceptible extent, the local vascular. We look into the mouth, but we see no swelling of the gums, no evidences of inflammation; yet the trouble is there, and it may be that it is only by incision that the fever is to be controlled; the diagnosis must therefore necessarily not unfrequently be of a differential character, or by exclusion. To aid us in this, we not only consider the absence of other causes of irritation, but we have a marked assistance in our knowledge of the varying periods of tooth eruption, and of the causes advancing or retarding such evolution.

Where dental evolution is inferred to be the cause of a febrile manifestation, and incisions do not seem demanded, we are to resort to ordinary general treatment. Lemonade, made with pounded ice, is a most grateful and refrigerating febrifuge; the neutral mixture, made fresh, by simply adding the carbonate or bicarbonate of potassa to lemon-juice, is another excellent medicine. This addition may be made to a full saturation.

Or a refrigerating mixture, made as follows, may be prescribed, and administered pro re nata in teaspoonful doses:

℞.—Liq. potassæ citrat. ℥iij;
Spts. æth. nit. ℥ss;
Ant. et potass. tart.
Morph. acet. āā gr. ¼. M.

Much relief is given by sponging the skin when it is very hot, using water and alcohol, or water and cologne, or water and vinegar. Bathing the wrists in cold water is another source of great comfort. Bromide of potassium is an admirable preparation to administer in febrile conditions. To children it may be given, dissolved in strong, ice-cold lemonade, in doses of two grains or more to the teaspoonful.

Tartar emetic, added to these doses in the proportion of the fortieth of a grain to each, assists its quieting influence. Where the pulse is much excited, and the infant is of sthenic condition, tinct. of verat. viride may also be added, one drop to each dose; in the use of this last agent, however, the effect is to be watched with care. Emetics are highly valued by some. Cathartics may also be used to good purpose, the sulphate or carbonate of magnesia being employed, as preferred.

When, in defiance of treatment, a fever of irritation continues, our efforts are to be directed to effects that may be produced outside of the ordinary functional disturbances. The extension of inflammation by continuity, where, for example, severe and unyielding inflammation resulting from dentition exists, may produce pharyngitis, parotitis, bronchitis, pneumonitis, gastritis, or it may excite to take an morbid action the brain, the heart, the liver, or, indeed, any organ of the body. When such sequela occur, we are to treat the parts involved as in any common inflammation, just, indeed, as we have been treating the unyielding fever, except that we may feel the necessity to make such treatment more vigorous; it may be that under such circumstances we will find the local or general abstraction of blood an absolute necessity, while derivation, by counter-irritation, will commend itself as all-important.

In these cases it is not to be forgotten, however, by the practitioner, that, conjoined with the original cause of inflammation, some other may exist; thus, a malarial influence may have been lying in abeyance, and needed but the depression, the result of the dental trouble, to allow of its asserting itself; or some half-corrected tendency to congestion is, by the excitation, entirely undone. Such associations are constantly to be considered if treatment is to be successful. This excitation of morbid action is well demonstrated in the association, with dentition, of diarrhœa and the cutaneous eruptions; while the treatment, wherever the secondary irritation shall exhibit itself, is recognized to have a common character.

3. *Diarrhœa.*—The alimentary mucous membrane being con-

tinuous from the mouth to the anus, it will be at once recognized that a localized inflammation could render irritable the whole tract. It is thus that diarrhœa, or, indeed, more commonly all the symptoms of cholera infantum, associate with difficult tooth eruption, and it is thus that to cure a diarrhœa or an attack of cholera infantum we have so frequently only to cut down upon a certain confined tooth or teeth. I am led, however, to infer that it is quite too common a practice, during the period of dentition, to ascribe to this process not only every diarrhœa, but the numberless other functional irregularities which may happen to occur at such period. Diarrhœa, or this combined with vomiting, has many causes external to the influences of tooth eruption.

The stomach of an infant may be likened to an enlarged portion of a common tube, and not only this, but it is a vertical or almost vertical tube; hence a child overfed needs only to be inverted to have the milk run from the orifice of the tube.

Again, the mucous membrane of the intestines of an infant is tender and susceptible; excess of food, or food not easy of digestion, irritates this membrane, and, by the relationship of tissue, excites to action the middle coat of the tube, yielding discharge or diarrhœa. Crapulous diarrhœa may thus be somewhat continuous, for the reason that, unassisted, the contractions may fail to relieve the canal of the source of offense, and thus their continued efforts keep up the continued discharges. Worms irritating the canal are not the infrequent cause of diarrhœa. In hot weather we generally have an increase in diarrhœa cases; and not only is the irritation thus induced not limited to the intestinal tract proper, but the liver as markedly sympathizes; hence the frequency in these months of cholera infantum, the excess of bile being thrown both ways. Enteritis, from follicular ulceration in typhoid conditions, may induce and keep up a diarrhœa in a child as it does in an adult. Tabes mesenterica is a cause of diarrhœa in the scrofulous infant. Syphilis may ulcerate and irritate the intestinal tract, just as we so frequently see such irritation in the mouth. These allusions are sufficient to remind us that diarrhœa is not a disease but only a symptom, and that, whether occurring in the dentitional or any other period, it may have, as its provocative, a great variety of sources or lesions. When a diarrhœa depends on a dental origin it is, perhaps, always a condition of vascular perversion, and is entirely direct in its nature; the erupting tooth or teeth inflames the mucous membrane of the mouth, and, by the continuity of tissue, the irritability ex-

pends itself over the intestinal portion of the structure. It is well to say that in diarrhœa of this character there is much or little mucin, according to the state of the inflammation, and much casting off of epithelial scales; but there is, of course, nothing diagnostic in such phenomena, because of not being peculiar to a particular form or character of inflammation. We are to look at the mouth, and we are to look at the throat; if there is a local condition of irritation and inflammation, and if the vascular derangement extends as far as we can follow it, we have reasonable grounds for inferring that in the teeth resides the origin of the trouble, particularly if, having examined the system at large, we fail in discovering other lesions. I desire not, however, to be understood as asserting that it is only in this way we have dental diarrhœa, for I too well know there is another way, and that is through the second of the legs of Bichat's tripod. I very well know that there is an influenced innervation, and that if the bowels of an infant are weaker than its lungs or its brain, that deranged innervation will there expend itself. I have seen the diarrhœa of such deranged innervation relieved almost instantly by an incision into a tooth-cyst, and yet there was no redness, no swelling, or other evidences of local excitability. These cases are, however, rare, and have their analogues in the reflex spinal irritations. The diagnosis must necessarily be somewhat differential in character; yet, where a case is at all obscure and the circumstances urgent, it is commendable practice to make incisions over the positions of teeth whose periods of eruption correspond most nearly with the time of operation.

It is very well, however, and indeed necessary, to remember that a mucous membrane may be inflamed, in varying localities, without having intermediate sanguineous disturbance. Thus a stomatitis and an enteritis might be present at the same moment; the one depending on local dental disturbance, the other upon a cause or causes of entirely dissimilar nature. Now in a case of this kind, having associative diarrhœa, it will plainly enough be seen that any treatment directed to the stomatitis would not (except as a similarity in practice might pertain to both troubles) affect the enteritis. To recognize these cases, antecedent conditions must be inquired into. Colds or atmospheric vicissitudes will, most frequently perhaps, be found an explanation of the disturbances. The cutaneous circulation, as a result of some inadvised exposure, has been depressed, and thus the enteritis has been forced upon a part having the least ability to resist the inrolling wave. In some in-

fants, restless and nervous in their natures, a predisposition to enteric irritation or inflammation seems to be inborn; the slightest disturbance reacts in this way. It may not be that diarrhœa is the result, but the irritation exhibits itself in some evident way.

The milk of a nurse is occasionally the source of a diarrhœa. Infusoria and crystalline substances will be found frequently, on examination, in such milk. Here a cure would only be obtained by a change from such diet to one which would be healthy or normal,—good cow's milk, diluted or pure, according to the age of the infant, being the best substitute. Other causes of diarrhœa, to be considered in connection with a supposed but doubtful dental source, are debility; hepatic derangements, interfering with the venous circulation; an increased peristaltic motion through mental emotions, as anger or fright; a rheumatic or scrofulous diathesis; malarial influence, etc.

Diarrhœa from dental irritation, if inflammatory by the continuity of relationship in the membrane, generally demands the lancet alone for its cure; the operator should free the advancing tooth or teeth. If, however, on the removal of such cause, the effect does not subside, the invoked and persistent irritability is to be treated on such principles as commend themselves. Sweet oil and paregoric I have found act very happily. To each teaspoonful of the oil add from five to twenty drops of the opiate, according to the age of the little patient. Heating applications to the abdomen are most useful; for example, a poultice made as follows:

Flour, ℥ss;
Mustard, ℥i;
Ginger, ℥ij;
Black pepper, ℥ss.

Mix these together with a little vinegar, and keep to the skin until it is well reddened. It is not at all necessary to blister the surface.

Another, and perhaps a more comfortable mode of treatment, is to give small doses of Dover's powder, or, what I prefer, the liq. potassæ citratis, in conjunction with minute doses of tartar emetic.

℞.—Spts. æth. nit. ℥ss;
Liq. potassæ citrat. ℥ij;
Ant. et potass. tart. gr. ½. M.
Give in ten- to fifteen-drop doses each two hours.

If the inflammation has anything of a sluggish or passive char-

acter, the spts. Mindereri will act happily. Half teaspoonful doses each two or three hours to be given.

Diarrhœa from dental irritation, not inflammatory in character, is to be treated in consideration of its nervous relation; and just here is a condition in which the bromide of potassium acts most satisfactorily. It may be given in five-grain doses, dissolved in water; or, if the practitioner does not like to commence in the infant with such a dose, he may try if less will answer his purpose, and increase pro re nata. Less than five grains, however, I do not think will do much good, unless, indeed, the child is very young. Spts. Mindereri, sweet spirits of nitre, and the camphorated tincture of opium also act most satisfactorily in these cases. They may be given in such proportions as indicated. An ordinary prescription would be about the following:

R.—Spts. Mindereri, ℥ij;
Spts. æth. nit. ℥ss;
Tinct. opii camph. ℥ij. M.
Sig. Twenty-five drops each two to four hours.

The following combination is a valuable one, when other sources of irritation, not perhaps thoroughly appreciated, exist in conjunction with the dental trouble:

R.—Hydrarg. chl. mite, gr. ij;
Pulv. opii,
Pulv. ipecac. āā gr. i;
Mag. carb. gr. xii. M.
Ft. chart. No. xii.
Sig. Dissolve, or mix with any convenient vehicle, one of these powders, and administer after each operation, if profuse, or otherwise each two, three, four, or five hours, according to judgment.

4. *Spasms.*—To appreciate the cause and condition of spasms and convulsions in early childhood, whether influenced or not by the excitement of dentition, one has but to consider the restless mobility of the cerebro-spinal system at such age. If, at an early period of life, we examine the gray matter of the spinal cord, we are struck with its development when compared with the similar substance in the cerebral portion of the encephalic mass. To express ourselves differently, the ganglion of excito-motor or reflex action we find to be much in excess in its development, and not only so, but sensitive and susceptible, as its offices are concerned, to the last degree,—a

result most likely of the necessity for the motion of growth and development existing in the members of a child; such a system may be compared to a tensely strung instrument, responding to the slightest touch.

The difference between a regular and irregular motion is the difference between an ability or disability of the cerebellar gray matter to perform its functions of co-ordination; the difference between a co-ordinated and an irregular motion is the difference of spasm, and if we carry it to the disability of the cerebral mass to influence, it is the difference of convulsion.

Spasm, then, may be defined to be irritation, direct or indirect, of the spinal cord or its terminal outshoots or nerves. This foundational principle appreciated, the further consideration of the subject is not at all difficult. Very true it is, that there may be causes of disturbance that we cannot discover; but the results, and the meaning of them, are not thereby rendered any the less obscure: it would be only the cure that would be delayed or denied.

We are prepared, then, to recognize in what way dental evolution is a cause of spasm: it is precisely as it is a cause of diarrhœa, as it is a cause of fever; but the reflected irritation in the latter case expends itself on the muscular system rather than upon the mucous or vascular. The cure or the mode of cure suggests itself: first, we are to remove the condition of irritation; second, if the parts do not quickly soothe and quiet themselves, we are to help them. To meet the first indication we simply lance the gums. I do not think that in these cases we are to be influenced too entirely by local manifestations of congestion—cut freely down upon teeth whose periods of eruption suggest them as being the source of offense. Take a pledget of cotton, and, saturating it with solution of morphia, thrust it, by means of some delicate instrument, into the cut you have made. This is quite equal to the more fashionable subcutaneous injection, and tends to soothe and quiet the disturbed nerve filaments. If yet the spasms should persist, some general effect on the nervous system at large must be secured. Tincture of valerian and gentian in equal parts, given in ten-drop doses, repeated pro re nata, will sometimes act most satisfactorily. If this should not answer, the bromide of potassium may be employed. The bromide, cantharides, and camphor, as recommended by Dr. Chambers in epilepsy, constitute an admirable combination.

R.—Potass. brom. gr. iij;
Tinct. cantharid. gtt. iij;
Mist. camphoræ, gtt. x. M.
Sig. Give this in a little water three or four times a day.

If, after proper trial of the above—say a few days—the irritability fails to be subdued, the inference will be that our diagnosis has been a mistake, and that dentition is not wholly, at least, in fault.

At this point we see the necessity of glancing at other causes of irritation which may exist. Many children incline to nervous derangements from anæmia; this we know to be a quite common cause of such derangements. An anemic condition might not of itself, in a special case, induce spasm, but assisted by conjunction with a second irritant, the two together could excite to the condition; and one removed, the other could very well resist a curative agent. A glance here shows us why the sedative has not effected the cure; let us add iron to our prescription, and a very few more days will give us a different result. Perhaps, on the contrary, the condition of a child is just the reverse; instead of being anemic it is plethoric. Give to this child repeated doses of some suitable saline mixture, and conjoin with the potassium quarter-grain doses of calomel; or, if you do not wish thus to medicate, starve it for a few days, give it nothing but the breast, and this only in the daytime; or, if the period is that of second dentition, deprive it of all but vegetable food, with water for drink; a cure would most likely follow such treatment. Lack of good, fresh, pure air, unwholesome food, deficient or improper clothing, sleeping with debilitated persons, the milk of the nurse, articles of food not easy of digestion, hepatic derangements, worms in the alimentary canal, influences passed from mother to infant, and numberless similar conditions, are exciting and predisposing causes of spasm and convulsions; and all demand, in every case, their share of consideration, if we are to be successful in treatment.

Spasm resulting from the congestion of nerve centers, however induced, is not unfrequently tonic in its character; the child may lose all consciousness; it passes into the state that we call convulsion. In these cases results must be obtained immediately; we must relieve the overburdened part. How? By derivation. Try first a hot foot-bath; let it be as hot as the skin will bear it. Inclose the steam of the water so that it shall envelop all of the child but its head; compel it, if possible, to take teaspoonful doses of the spirits

Mindereri. The steam, or the steam and mixture in conjunction, will soon compel profuse perspiration, and thus secure a double derivation. Such treatment will, most likely, relieve the congested part; at least it has generally proved most reliable in my hands. If it should not answer the intention, then a vein may be opened, or leeches may be applied. The opening of a vein in such cases I have never had occasion to resort to, but it is good practice, and is recommended by the best writers. The pediluvia and derivation by perspiration, I think, however, will be found reliable. If, after consciousness is restored, the pulse continues rapid, with fullness, give one-drop doses of the tinct. verat. vir., or relax the system generally by doses of tinct. lobelia or ipecacuanha. Ten drops of either of these medicines will very well answer the purpose. Keep the child now cool, and guard against every source of discomfort.

Passive congestions are sometimes a cause of infantile spasms; these are not difficult to distinguish from the acute or active conditions, the languor and sluggishness markedly contrasting with the turgidity and fullness. Again, it is distinguished from the active condition in its results, these being not immediate, but mediate. Passive congestions depend on some obstruction in the circulatory apparatus, and are, perhaps, more frequently associated with the chylopoetic than with any other system. Stagnations occur as a result of some interference with the respiratory office, or they may be the result of the action of some directly sedative poison. Wherever, and however they exist, they are to be removed, if possible, by meeting and combating the cause, which, of course, is the only philosophy of cure.

"In cases of pure irritation," says Dr. Wood, "besides removing the cause, it is proper to diminish the nervous susceptibility and to control the cerebral irritation by diffusing the excitement over the whole system. To meet the first indication, narcotics may be employed; and none is more efficacious than opium, which, to diminish its stimulant influence, may be combined in some instances with ipecacuanha. Hyoscyamus, lactucarium, or conium may be substituted, if on any account thought preferable. But before resorting to these remedies, the practitioner must be very sure of his grounds. He must be quite convinced that it is nervous irritation, and not active congestion of the brain, that he has to encounter. The second indication, above alluded to, is to be fulfilled by antispasmodics, administered by the mouth, the rectum, or the skin, and by

the use of tonics, of which the metallics are deemed most efficient. Of these the oxide of zinc has perhaps enjoyed most reputation, though the chalybeates should be preferred in anemic cases. Should the digestion be impaired, and the system at large feeble, the simple bitters or quinia might be preferable to the metallic tonics. These remedies may often be combined in the same prescription. Thus, opium or hyoscyamus, assafetida, and either oxide of zinc, carbonate of iron, sulphate of quinia, or extract of gentian or quassia, may very properly go together. The cold or shower-bath, cautiously used, may also serve to strengthen the nervous system. Fresh air and nutritious diet of easy digestion are important. Any derangement in the hepatic secretions should be carefully observed, and treated with minute doses of calomel, blue pill, or mercury with chalk. When the disease depends on intestinal spasm, great advantage will often accrue from the use of laudanum, with assafetida or spirits of ammonia by the mouth, the injection of musk into the rectum, the application of a mustard cataplasm, or blister over the abdomen; and if, as often happens, the bowels are distended with flatus, from the introduction of a catheter into the colon, and drawing off the air by means of a syringe. Should the disappearance of an eruption have preceded the convulsions, efforts should be made to restore it by friction with croton oil or other active irritant. In urgent cases a blister might be produced, by means of a strong solution of ammonia, on the surface previously affected.

"In frequently recurring convulsions, resisting other measures, and threatening life, the practitioner would be justified in resorting to the inhalation of chloroform, which will often quickly quiet the spasms; and if reapplied with each return, may obviate the danger until the tendency is past. It has the advantage, moreover, over other narcotics, of not congesting the cerebral centers, though the danger of fatal prostration from its use must not be forgotten.

"Even when asphyxia or apparent death may have resulted from the convulsions, hope should not be abandoned; but efforts should be made by artificial respiration to restore the functions of the lungs, and consequently that of the heart."

Finally, on this subject, I may direct attention to the connection between the troubles we are considering and the predispositions of an hereditary nature, so often found in association. When these deteriorative conditions exist, it is a necessity for success in treatment that we consider and combat them.

5. *Eruptions.*—That the skin of childhood should be the subject

of irritative changes is certainly only what is to be expected, and that variations in condition do most frequently occur is as true as that they are thus expected.

Certain general considerations of the subject give us, I think, the key-note. Thus, in the beginning, a momentary thought directed to the great change which must result in the passage from intra- to extra-uterine life, would naturally lead to the anticipation of a cutaneous hyperemic condition at once to be developed. In intra-uterine life we not only have the delicate and susceptible skin lubricated with the soft, bland smegma, but pressure on any and every part is jealously guarded against by the surrounding amniotic fluid. A single minute, frequently, and the most irritative changes occur: the waters pass away, the uterus crowds and passes upon every part of the child, while the outside world, still less considerate, receives it on its birth, its atmosphere stimulating and irritating, its rough points jagging and abrading, while unnecessary, and too frequently ill-advised, appliances and applications add to the common discomfort.

Cutaneous hyperæmia—erythema, as it is generally called—is a child's primary skin trouble. Such an erythema is certainly nothing more nor less than the variegated blush of an overstimulated circulation. Perhaps if the smegma were left undisturbed for a few hours, just as nature smeared it over the body, or until the skin had become somewhat accustomed to its new atmosphere, such hyperæmia would be avoided; but as such excitability seems to do no immediate harm to the child, neither nurse nor mother, I imagine, would be found satisfied with such an arrangement. But does this hyperæmia do no harm? Does it not provoke an excitability in the skin which would be better absent? Certainly children are most susceptible to cutaneous impressions, as witnessed not only in colds so easily taken, but by the variety of local manifestations, to the relief of which the practitioner is so frequently called. Dental irritations pertain to these troubles only as they act as excitants to the pre-existing predisposition, or as they keep up an excitability which overmasters the corrective force natural to the vis vitæ.

Hyperæmia running into an excess is inflammation. Inflammation of the skin finds a primary expression in the term dermatitis. A dermatitis has secondary signification, as it presents peculiarities which lead us to look for reasons for such expressions. Thus, one inflammation in the skin is a simple sthenic increased vascularity, having the phenomena of redness, heat, pain, and swelling. A

second is not regular and honest in its expressions, but throws out claw-like expansions, and looks dusky and threatening, throwing to the surface, here and there, blebs of serum. We distinguish this second from the first by the subterm erysipelas, or erysipelatous inflammation. Then we have an inflammation which presents the peculiarity of studding the face of the skin with pustules, and this derangement we distinguish by the term pustulæ or pustular inflammation. Another form which covers the inflamed surface with vesicles; another which throws out groups of nodules—papular; another which circumscribes its redness to patches—rashes; another which presents raised or elevated patches—urticaria, etc. All having alike the primary signification of a perverted circulation, but differing in presenting each distinctive phenomena, which mark differences in local or constitutional circumstances.

That dental irritation develops or creates the distinctive features in a skin disease is sheer nonsense. All that such irritation can have to do with the matter is that it exhausts the system, just as any pain exhausts and tires us, and reduces, as remarked, the ability of the vital force to guard or protect itself against an enemy or enemies in waiting at the threshold. It does not make the enemy, it only lets him in by weakening the bars.

That a skin disease is thus introduced, and continued in an ability to resist applied medication, is true beyond the shadow of a doubt; and it is for such a reason that the consideration of dental irritation, in connection with infantile skin diseases, is most important; and yet this study, as the evolution of the teeth are concerned, differs in no wise from its study in relation to stomatitis, diarrhœa, or spasm, as certainly any intelligent mind must at once appreciate. It does differ, however, as far as a collateral treatment is concerned, and such treatment implies the study of skin diseases, as in works on dermatology the subject is presented. It comes within our province here, however, simply to state some generalizations in such a direction,—an idea, if the reader pleases, as to the mode which such an investigation might be entered upon to compel it more readily to yield to us its secrets.

A thousand complex scientific terms would scarcely exhaust the vocabulary of the dermatologist of the signification he has for the varieties and modifications of pathological skin phases. These thousands of conditions, however, are found to revolve around eight centers, as radii from a star. The center of each is the nucleus or pith of the divisions, and the subdivisions are but radii of the common substance.

All skin diseases belong to one of eight orders:

1st. Pimples.
2d. Scales.
3d. Rashes.
4th. Bullæ.
5th. Pustules.
6th. Vesicles.
7th. Tubercles.
8th. Spots.

1. *Pimples—Papulæ.*—Small and pointed elevations of the cuticle, with an inflamed base—very seldom containing fluid, seldom suppurating, and commonly resolving as scurf.

Three primary divisions of papules are made: strophulus, lichen, and prurigo.

Secondary divisions.—Strophulus intertunctus.
S. albidus, S. confertus, S. volaticus, S. candidus.
Lichen simplex, L. pilaris, L. circumscriptus.
L. agrius, L. lividus, L. tropicus.
Prurigo mitis, P. formicans, P. senilis.
P. pudendi muliebris.

2. *Scales—Scaly Diseases—Squamæ.*—Scales or lamina form upon the skin. Scales are of various forms. In some cases, as in pityriasis, resembling a scurf; in other cases, as in ichthyosis, being broad and flattened, and bearing likeness to fish scales. To mark the various prominent differences, four varieties are enumerated: Psoriasis, Lepra, Pityriasis, Ichthyosis.

Subdivisions.—Lepra vulgaris, L. alphoides, L. nigricans.
Psoriasis guttata, P. diffusa, P. gyrata.
P. inveterata.
Pityriasis capitis, P. rubra, P. versicolor, P. nigra.
Ichthyosis simplex, I. cornea.

3 *Rashes—Exanthemata.*—Irregular, variously figured patches, appearing on various parts of the body, leaving interstices of a natural color, and terminating in exfoliations of the cuticle. The designation is generally limited to efflorescences, originating in fevers, as for example measles and scarlet fever.

Bateman, however, includes, and perhaps more philosophically, Erythema, Urticaria, and Purpura in the division.

The first division is, then, according to Bateman, Rubeola, Scarlatina, Urticaria, Purpura, Erythema.

Subdivisions.—Rubeola vulgaris, Scarlatina simplex.
S. anginosa, S. maligna, Urticaria febrilis, U. evanida.
U. persistans, U. conferta, U. subcutanea.
U. tuberosa, Purpura simplex, P. hæmorrhagica.
P. urticans, P. senilis, P. contagiosa, Erythema læve.
E. papulatum, E. tuberculatum, E. nodosum.

4. *Bullæ.*—A condition in which effusion occurs on the true skin, separating the cuticle in the form of blebs or blisters. An effusion developed by a blister comes justly in its consideration under this head, for it is surely not less a bleb that have produced it—the difference between such a bleb and one produced by an erysipelatous inflammation is that one has strictly a local signification, while the second is a systemic condition. Blebs or bullæ have three primary classifications: Erysipelas, Pemphigus, Pompholyx.

The subdivisions are into Erysipelas phlegmonodes, E. œdematodes, E. gangrænosum, E. erraticum, Pompholyx benignus, P. diuturus, P. solitarius.

5. *Pustules—Pustulæ.*—An inflammation of the skin, resulting in the formation of purulent matter, which accommodates itself by throwing up little circumscribed tumors. Whether one or many of these pustules rise on a common inflamed base depends on the fundamental or exciting cause; and because the conditions which produce pustular inflammation vary, so have we various names by which to distinguish and appreciate these causes. Five primary pustular inflammations exist: Impetigo, Porrigo, Ecthyma, Variola, Scabies.

The subdivisions are numerous, depending on peculiarity of features. Impetigo figurata, I. sparsa, I. erysipelatodes, I. scabida, I. rodens, Porrigo larvalis, P. furfurans, P. lupinosa, P. scutulata, P. decalvans, P. favosa, Ecthyma vulgare, E. luridum, E. cachecticum, Variola, Scabies papuliformes, S. lymphatica, S. purulenta, S. cachectica.

6. *Vesiculæ—Vesicles.*—Vesicles differ from pustules in containing lymph—they look like little water pimples, although it is very frequently the case that the contained lymph is quite opaque: the end of a vesicle is by scurf or scab. There are seven primary varieties: Varicella, Vaccinia, Herpes, Rupia, Miliaria, Eczema, Aphtha.

The subdivisions are Varicella lenticulus, V. conoidæ, V. globate, Herpes phlyctænodes, H. zoster, H. circinatus, H. labialis, H. præputialis, H. iris, Rupia simplex, R. prominens, R. escharotica,

Eczema solare, E. impetiginodes, E. rubrum, Aphtha lactantium, A. actultorum, A. anginosa.

7. *Tubercula—Tubercles.*—These are small, hard, circumscribed tumors—they may be fixed in a state of integrity, or they may be degenerative. There are eight kinds of these tumors—or, to express it differently, there are eight distinctive differences: Phyma, Verruca, Molluscum, Vitiligo, Acne, Sycosis, Lupus, Elephantiasis, Frambœsia.

Among these, subdivisions seem only necessary with acne and sycosis. Thus, there are three peculiarities in acne, which are marked by the terms Simplex, Indurata, Rosacea. In sycosis, Sycosis menti, and S. capillitii, designating the location of the tubercules.

8. *Macula—Spot—Mother-Mark—Freckles or Ephelis—Nævus.*

These eight classifications, after Bateman, with his subdivisions, make out of skin diseases all that they deserve. It is for the student to comprehend the primary divisions, as their pathological differences are concerned; the radii, or subdivisions, will be found to take care of themselves. Without an understanding of the general subject one could scarcely expect to appreciate any accidental or positive dental relations. The subdivisions will be remarked, on examination, to be simply as family surnames distinguishing one child from another; it is true, of course, that there are peculiarities of character, just as each child is peculiar, and, by such peculiarities, are these modifications on the primary condition named. Now, it is not by any means common to associate all these conditions with dental irritations; yet it is certainly true that any one of them may have such association: therefore, if the student would understand one he must understand all.

CHAPTER VI.

ANOMALIES OF SECOND DENTITION AND THEIR SURGICAL RELATIONS.

ANOMALIES in second dentition may be classed under seven heads:

1st. Teeth common to the age, but erupting external or internal to the arch.

2d. Teeth denied space in the arch, because of natural or surgical interference with the process of maxillary enlargement.

3d. Germs, developing in positions where their product must remain encysted.

4th. The production of supernumerary teeth.

5th. Third dentitions.

6th. Teeth, the periodonteum of whose fangs is in association with the periosteum of the sinus maxillare.

7th. Germs, with heterogeneous development.

These seven conditions, then, because they differ from a just or normal dental evolution, we call anomalies.

ANOMALY FIRST.—A tooth external or internal to the alveolar arch not unfrequently gives origin to an ulcer or locates epithelioma. Yet close as is this primary to the secondary lesion, and evident as such relationship would seem to be, I have known ulcers of the tongue, lips, and cheeks treated for months—of course, without success—where it has never seemed to strike the practitioner that the tooth could have any association with the disease; indeed, in one case, where the patient was remotely connected to myself, a horrible death was the result of a cancer located in the cheek from this very anomaly.

Note.—Even where there is excess of room, the permanent teeth not unfrequently erupt irregularly; indeed, this applies so directly to the inferior incisors, that it may almost be said to be the rule rather than the exception. Unless, however, specially indicated, it is the best practice to leave them to nature; they will almost always be found to come right of themselves. I would be understood as classing them with the anomalies only as the derangement is marked and permanent.

Anomaly Second.—Teeth denied space in the arch. This anomaly has perhaps the largest associative pathological connection.

I remarked that this lesion, if we may term it such, is more frequently the fault of the surgeon than of nature. If, for one moment, we refer to certain physiological relations existing between the first and second dentures, we may find that it is within our power to prevent the many ills that follow so frequently in this train, and simply by doing little, or, more commonly, nothing.

The deciduous dental arch is filled, as we are all aware, completely by its ten teeth. The second or permanent set is to comprise in number sixteen, and each tooth certainly quite as large again as its predecessor. This increase in number and size of the teeth, it is evident, must be provided for in an enlargement of the alveolar arch. This provision is always attempted by nature in the process described by the physiologist as the elongatory.

I will illustrate this process of maxillary enlargement by considering the ten milk teeth as so many wedges placed in a springy arch. This arch it is designed to lengthen by additions to either end. If, now, these wedges should be removed before others were ready to take their place, it is evident that the elongation, being made at the ends, would, to a greater or less extent, be counterbalanced by the springing together of the parts at the sites of the removed wedges. The process of maxillary or rather alveolar absorption, is truly represented by this retraction of an arch * In proportion to the number of deciduous teeth removed prematurely, will be the curtailment in size of that arch, at least of its alveolar face.

Let us, then, look at the results of such abridgment—approximal caries of the teeth, periosteal troubles, trismus, odontocele, necrosis, the violent inflammations attendant on the development of the dentes sapientiæ, etc.

Note.—If there is a pathological Pandora's box, it is certainly the lesion of an overcrowded maxillary arch.

Such condition is made evident to the practitioner the moment he looks into the mouth of his patient: the teeth are jammed into the most uncomfortable-looking positions; the deformity, however, mostly existing in the front of the mouth,—either the central incisors override, or the laterals are thrown back, or otherwise the cuspidati

* Prof. Gross, and Mr. Tomes also, in his last book, denies this position; why, I know not. With the greatest possible respect for the opinion of these gentlemen, it is my experience that they are wrong.

take the tusk position, standing out prominently from the arch, the bicuspids occupying too anterior a location, approximating, indeed, not unfrequently with the lateral incisors.

Treatment.—To abort the ill consequences of such a contracted arch, extract at as early a period as possible the bicuspids of either side. This very simple operation will frequently not only secure against secondary lesions, but will occasionally correct the most annoying deformities. But let it be remembered by the practitioner who prefers prophylactic to operative surgery, that on his treatment of the deciduous mouth depends, in a measure, the health and comfort of the adult.

If I am asked what is to be done with the deciduous aching tooth, I may answer that the tooth should have been filled on the first appearance of decay; the dentist has in his armamentum plastic materials which he can employ in such cases, and which will be found to answer admirably the purpose of their intention.

Equal parts of chloroform and tinct. aconite applied to the nerve on a delicate pellet of cotton, will sometimes instantaneously cure this form of toothache. Arsenical applications are not unfrequently employed, but unless the practitioner is very conversant with the physiological change that occurs in the fangs of these teeth he had better not use it; if, however, he feels prepared to employ escharotics, he can prepare no formula better than the following:

R.—Acidum arsenicum,
Morphiæ sulph. āā gr. x;
Creasote, q. s. to make a thick paste.

This is the paste so universally employed by the better class of dentists for destroying the pulps of adult teeth. To apply it, take a piece not larger than a pin's head, and dropping it lightly into the cavity, cover loosely with cotton; the cavity is washed out with warm water after ten or twenty hours. I would not leave it in a deciduous tooth over ten hours; and if absorption of the fang had advanced to any extent, even one might be too long. Employ it fearlessly in the adult mouth, only remembering you deal with arsenic, but with the child be careful. Equal parts of tinct. of iodine and Monsel's solution of the perchloride of iron is also an admirable application. I have stopped a raging odontalgia instantaneously with this combination. Give the mother a prescription for this last, or some sedative formula, but do not pull out the teeth.

The central incisors of the deciduous set should last until the

seventh year; the laterals until the eighth; the first deciduous molar until the ninth year; the second until the tenth; the deciduous cuspid until the eleventh; and let it be remembered that the most posterior molar teeth that are in the mouth at the sixth year are the first permanent molars, and that these teeth get their place in the jaw, without displacing any of the deciduous.

For an account of some of these secondary lesions, together with treatment, see a future page.

Anomaly Third.—This anomaly is remarked by examination of the classes of teeth erupted. Teeth all erupt in pairs, so that one is not likely to be deceived. The anomaly is not unfrequently the result of interference with the development of the germ of the permanent through non-absorption of the root or roots of the deciduous teeth.

Example.—A deciduous central incisor erupts—as the rule—about the seventh month, and is succeeded by the permanent at the seventh year. Now the physiological relation existing between the two teeth is as follows: at the time when the deciduous has attained its fullest development the germ of the permanent is at its apex. Retrograde metamorphosis now commences in the fang of the deciduous, while, in an inverse ratio, the development of the permanent advances. Now, it sometimes happens that no process is set up for the taking away of these deciduous fangs, and, as a consequence, the permanent are compelled to make alveoli for themselves; this they generally do by emerging posterior to the deciduous; but, as can readily be imagined, odontocele or encystment is not unfrequently a result.

Note.—Sometimes, long after the period at which the second dentition is usually completed, the incisors, as would seem to be natural, may be remarked, each occupying its respective alveolus. Yet here we may have odontocele. One of the incisors that we see is a milk tooth. This anomaly could, however, deceive only the very superficial observer, the difference in the classes of teeth being sufficiently marked.

Because of this non-absorption of deciduous fangs, arrest in the development of the permanent sometimes occurs. It is really quite a nice point in practice to give advice in such cases; if you direct the extraction, and no tooth comes to replace the one lost, you will be sure to get a good deal more censure than you could possibly deem yourself deserving.

There are a number of conditions to take into the consideration

of such a case—the most prominent one of which is, the existence or non-existence of the anomaly in a hereditary point of view. I am acquainted with a family where continued integrity on the part of certain front teeth, conjoined with the non-appearance of the permanent, has been a striking peculiarity as far back as the ancestors can be remembered. Ability to advise, in such cases, can only be gained by a careful study of the laws of dentition.

Surgical Relations.—In an examination of any obscure tumor of the maxillary bones, examine the dental arch; if a deciduous tooth occupy the place of a permanent, the existence of odontocele may be reasonably inferred.

Anomaly Fourth.—*Supernumerary Teeth.*—These teeth differ from all others in being doubly conoidal; this is the rule. It is, however, to be remembered that we meet with exceptions. Harris mentions having seen them so resembling the natural teeth as "to make it impossible to distinguish which should be called the supernumerary;" as for myself I have never met with such decided exceptions.

An encysted condition of these teeth obscures very much the recognition of their existence. In diagnosing diseases of the mouth, we must bear in mind that we have such odontoceles. The study of their evolution is very interesting; but, of course, concerns the physiological rather than the surgical author. We may remark, however, that they are not necessarily a dermatic production, and the appearance of them in the mouth is as unaccountable as their association with ovarian and other remote tumors.

Surgical Relations.—With the exception of their relation to tumors, we have only to deal with them as they so strangely present themselves in the mouth. Let me give an example of such practice. A patient presents himself and tells you that there is a piece of bone working out through his mouth; and, truly, an examination will seem to verify his assertion. But there is one point which, if observed, will never mislead. Necrosis is always preceded by, and is associated with, inflammation. The eruption of a supernumerary tooth is very gradual, and, so far as my experience goes, is never associated with inflammation. To extract such teeth, wait until they have emerged to the base of the cone; or, if such waiting does not seem desirable, carefully force sharp-pointed forceps through the bone until you may be able to grasp this cone, then with a rotary motion you may easily pull them away. Their alveoli need no attention.

Anomaly Fifth.—*Third Dentitions.*—I would not be understood as referring here to that extra development sometimes occurring in young adult life, and yet the mention of the existence of such an anomaly is, perhaps, desirable. Thus Columbus reports that one of his children had three sets of teeth. Valerius Maximus and Pliny relate similar facts. A son of Mithridates is said to have had two, and Hercules three. I myself have seldom seen this anomaly, and incline to think that its existence, in these modern times, is not co-extensive with the ancient period I have certainly had quite five hundred persons tell me that such and such tooth or teeth were the third of the class, but examination, in almost every individual case, has satisfied me they were mistaken; this anomaly has, however, surgically, little or no signification.

Third dentitions, as here referred to, are those which are associated with advanced age. The student will recognize their physiology when I classify them with second sight, etc. The lesions of this anomaly are what might be termed associative—that is, we are occasionally so deceived by them as to be led falsely to interpret engorgements, congestions, etc.

A single case will illustrate the anomaly: an individual, aged sixty-five, applied to Dr. Harris, suffering with pain in the gums and jaws. No local lesion was at all discoverable. A tentative treatment was resorted to. The apparent disease went on, however, entirely uninfluenced by the experimental medication, until, at last, it attained an intensity positively excruciating. In twenty-one days the mystery was explained by the eruption of a third set of teeth.

Anomaly Sixth.—Association of the odonto-periosteum with the membrane of the antrum of Highmore.

It will be remembered that the most easy entrance to the maxillary sinus is through the palatine fang either of the second or first molar tooth. It is, indeed, as I well know from experience, a very common thing to find the roots of these teeth perforating the cavity. Remembering this association of parts, it will be seen that many conditions, which may have been deemed obscure, are thus made very plain. Dr. Harris, who was a close observer in diseases of the mouth, went so far as to say that two cases, mentioned by Bell and Bordenave, were the only authenticated exceptions where abscess had formed in this cavity at any other point than that at which it had been penetrated by the root of a tooth.

A case mentioned in Braithwaite, from the practice of a Mr. Louis Oxley, of London, illustrates most happily the relations of this

lesion: A young woman, of rather strumous habits, complained of a dull, aching pain under the orbit. The pain lasted from three to four months, attended by a gradual elevation of the orbital surface of the maxilla. The eye above this surface became at length so affected as entirely to lose its functions. At this stage of the case the young woman was directed to use leeches and blisters behind the ears, and to employ drastic purges. After three months' blindness, the patient first perceived a discharge, from the right nasal fossa, of a thick, purulent fluid. This discharge had existed, he says, eighteen months, when he first saw the case. An examination of the mouth at once revealed the cause of so much misery, and the removal of three roots, in a state of periostitis, was the simple means by which two most important organs regained their proper functions.

The nasal opening of the maxillary sinus, it is known, is, in a healthy condition, almost closed by the duplicature of membrane lining the turbinated and neighboring bones; congestion of this membrane not unfrequently closes it entirely. Thus secretions accumulate, giving alarming and threatening disfigurements to the face. The weakest points in the osseous boundaries of this cavity are, the floor of the orbit, the hard palate, the tuberosity of the bone, and the canine fossa. Any accumulation would necessarily be most apt to vent itself at one of these four points, unless atresia of the duplicated membrane alluded to should occur, and which is not commonly the case.

Note.—My own experience regarding abscess of the antrum is, that in the great majority of cases the pus seeks to vent itself through the floor of the cavity. After the inflammatory action has passed to the suppurative stage, you will notice a swelling in the roof of the mouth at the side of the mesial line, corresponding to the diseased cavity: this is the abscess pointing, and, if left to itself, will be sure to make an ugly opening. Such a result will be found particularly undesirable if there should be any specific virus lingering in the system. But wherever this abscess should tend to point, it is of course desirable to abort it.

If the assertion of Harris is true, concerning the almost invariable dental origin of this abscess (and certainly my own experience, so far as it goes, confirms him; for, while I have seen several cases of this kind, I have yet to meet with one where the treatment indicated was not of a surgico-dental character), we turn naturally to the alveolar arch, seeking there the source of offense and defense.

For a single moment, then, let me direct attention to a few dental lesions of the most practical character, and without the ability to recognize which, the practitioner will assuredly find himself at sea.

Because, when you turn to this dental arch, you find it entirely clear of teeth, and healthy-looking, you are not hastily to conclude that the primary lesion is not in such direction. You are to remember that fangs of teeth are not unfrequently broken off in an attempted extraction, and that when so broken, particularly deep in the socket, the dentist is not unapt to leave such pieces alone. Now it is easy to understand that a fang so situated may be the source of extensive disease, and yet the gum over it be without break in its continuity, and perfectly healthy-looking. The relation, in such a case, of the fang is with the antrum—it need necessarily have no external sinus. Make here an explorative incision along the gum down to the bone. If, happily, you come to a cavity, you will have hit on the origin of the trouble; but if you find nothing, you have made only a simple incised wound, which left to itself will generally heal in a few hours.

Again, because the part may have its usual complement of teeth, and each tooth should seem perfectly healthy, you are not to turn hastily away. There may be in one of these teeth a dead pulp. To satisfy yourself on this point, take up a delicate steel instrument, and strike with it each tooth separately, directing your patient to note any difference in the sensations; if he should start when you strike a particular tooth, my veracity for it, you have found the primary lesion. But still again, the lesion may be here, and yet the patient not express the anticipated pain. Take now a hand-mirror, and placing your patient full in the sunlight, reflect the rays over the teeth,—if there is a dead tooth, you will remark an opacity in it not belonging to its neighbors: this is the tooth; extract it.

If a tooth has a plug of metal in it, take the filling out,—the cavity will, not unlikely, be found to communicate with the pulp chamber.

If, now, for a few moments, we study periodontitis, the student will be prepared to make the most of the cases which we shall have to consider under various heads associated with such lesions.

Periodontitis means inflammation of the periosteum which surrounds the fang of the tooth. Its causes are manifold: scurvy, syphilis, ptyalism, a dead pulp, direct injury to the part. It is sometimes an idiopathic affection,—stomatitis from any cause may provoke it, simply by continuity of structure; it is very common

after the dentist has destroyed the pulp of a tooth and filled the fangs with gold or other metal. A common cause, as remarked, is an overcrowded condition of the alveolar arch.

Periodontitis commences with a dull, heavy, gnawing pain: this is the state of simple vascular excitement in the part. As the grade of inflammation advances, the pain increases with it, the tooth seems to project beyond its fellows, and really does so; occlusion of the jaws gives agonizing pain; finally, if not arrested, the action goes on to the suppurative condition, yielding alveolar abscess. Now, it is to be borne in mind that gum-boil is alveolar abscess, and this is the way in which the pus formed commonly vents itself; but, from cases hereafter mentioned, it will be seen that so simple a thing as alveolar abscess may utterly confound and deceive even very experienced men.

Alveolar abscess almost invariably runs into a chronic condition. When discharging on the gum, it may run through the features of gum-boil once a week, or once a month, for years; it will discharge from a single drop to a spoonful of pus per day; will be one day apparently well, and the next in full discharge. The excruciating pain referred to, pertains almost exclusively to the original inflammatory attack, although the tooth continues more or less sore until a complete cure is effected. The inflamed periosteum of one tooth will not unfrequently so affect surrounding parts that a patient cannot possibly locate the seat of pain. (See chapter on *Trismus.*)

Diagnosis and Treatment.—The affected tooth will always respond to a stroke from a steel instrument, whether the attack is of the acute or chronic form. No such response is made so markedly in any other form of odontalgia.

A periosteal inflammation may, in nine out of twelve cases, be aborted as follows: pass a lancet several times through the gum down to the alveolus; let the patient hold water in the mouth so as to prevent the formation of clot, and provoke free bleeding. As soon as the vessels and capillaries have disgorged themselves, paint the parts heavily with tinct. of iodine, the officinal strength. The philosophy of this treatment is sufficiently evident not to need explanation.

Chronic periosteal inflammation is most certainly cured by extracting the offending tooth; when this, however, seems undesirable, inject through the sinus, which passes from the gum into the cyst, at the root of the tooth, the tinct. of iodine; do this for three or four days, and then force through the sinus a tent of cotton. Leave this

tent to nature; its ejection will most generally be found to be the result of the healthy granulations which will have obliterated the cyst.

Anomaly Seventh.—*Germs of Heterogeneous Development.*—It occasionally, indeed frequently, happens that the dental germ, instead of arranging its parts according to the ordinary laws of its nature, assumes the most fantastic and heterogeneous shapes, giving such a variety of appearances that only a close attention could appreciate its dental character. Tumors of complex kinds are thus occasionally produced, and, unless appreciated, are necessarily the source of much anxiety both to surgeon and patient. In the admirable memoir of M. Forget, crowned at the Academy of Sciences, Paris, in 1859, are illustrations of cases both of this seventh and the ordinary anomalies. I present them to my readers as being quite as satisfactory studies as perhaps could be selected.

PLATE I.

FIG. 1.—*b*. Osseous tumor united to a molar tooth (*a*).

FIG. 2.—*a*, *b*. Section of the tooth and of the tumor.

FIG. 3.—*a*, *b*. Dental tumor formed by the anomalous development of the first two molars.

a. Summit of the tumor. *b*. The root of the tumor.

FIG. 4.—*a*. Cyst of the right branch of the inferior maxillary bone, the cavity of which is made visible by the circumferential resection of its external wall.

b. A molar tooth inclosed in the osseous tissue, and *en relief* upon the bottom of the cyst.

c. External wall of the cyst, inverted.

d. Condyle and neck of the jaw.

e. Summit of the coronoid apophysis, with the insertion of the temporal muscle.

FIG. 5.—Upper jaw of a horse; view of half of the palatine face.

a. Osseous cyst developed in the interior and right side of the jaw; it includes the tumor represented by Fig. 6.

b. Right canine, thrust backward and inward toward the mediopalatine line.

d. Alveolus of the left canine tooth.

e. Osseous perforation, conducting to the interior of the cyst.

FIG. 6.—Intramaxillary osseous tumor (natural size); it was contained in the cyst represented in Fig. 5.

FIG. 7 (300 diameters).—Represents a part of the section of the tumor shown in Fig. 6. This tumor appears to be formed entirely of the cement or osseous substance surrounding the dental root. It is an exostosis of the dental cement. This exhibits the structure described in the explanation of Fig. 4, Plate I.

a. Vascular canaliculi of the osseous substance of the tumor (Havers' glands). The tumor traversed by these as in the normal osseous substance—only they are more rare, more scattered, and more irregularly distributed.

b. Osteoplasts disposed circularly, or nearly so, in a concentric manner around the Haversian canal, but less exact and evident than in the normal condition.

c. The osseous substance, properly so called, in which the osteoplasts, or characteristic cavities of the osseous tissue, are excavated.

PLATE I.

Fig. 1

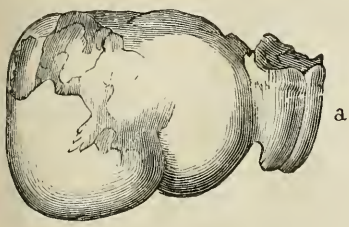


Fig 2

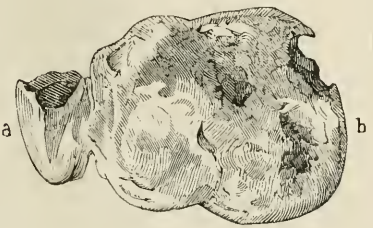


Fig 3

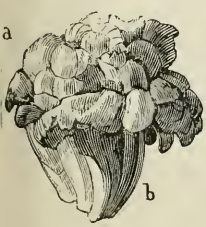


Fig. 4

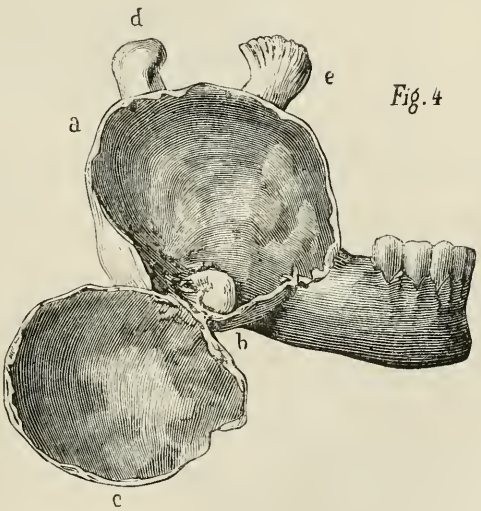


PLATE I.

Fig. 5

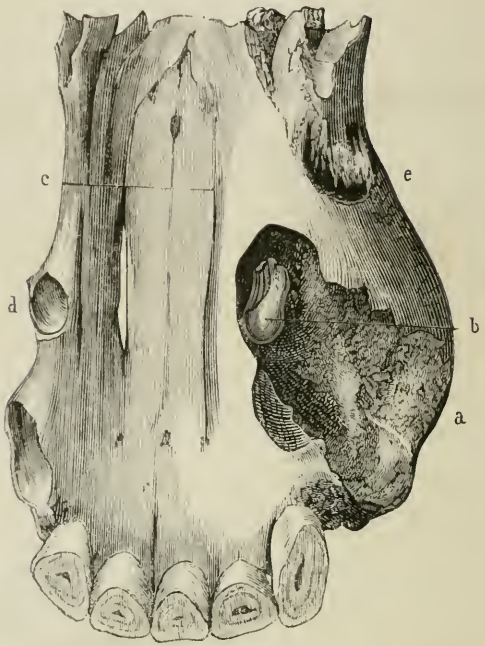


Fig. 6

Fig. 7

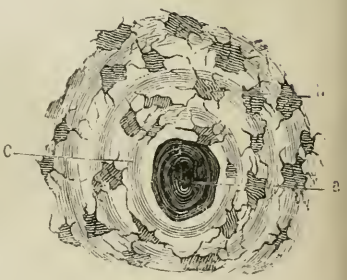


PLATE II.

FIG. 1.—Represents a cyst occupying the whole extent of the right half of the body of the lower jaw, and of the coronoid apophysis. The external wall of the cyst has been removed, and permits a view of the cavity, bounded by the internal wall *b*, which remains.

a. The wisdom tooth, developed in an anomalous fashion in the base of the coronoid apophysis.

c. Dental canal, open through the whole of its extent. It does not communicate with the cavity situated above it.

FIG. 2.—*d*. Right side of the inferior jaw, affected by the rarefying osteite.

a. Large molar tooth encysted in the bone.

b. Interior of the cyst, with a black bottom, representing the membranous tissue that lined its surface.

FIG. 3.—Same cyst, open at the side of the mouth. It reproduces (*a* and *b*) the aforesaid anatomical arrangements.

FIGS. 2 AND 3.—*c*, *c*. Three incisor teeth, the canine tooth and the first two molars, removed from their position, and retroverted one upon another.

PLATE II.

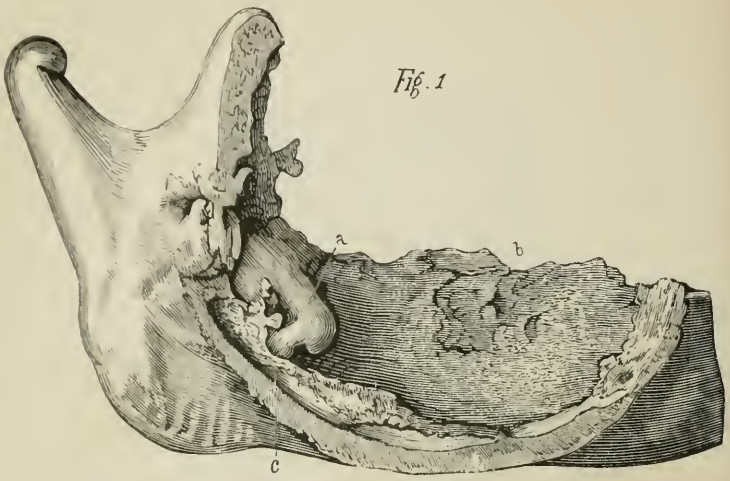


Fig. 1

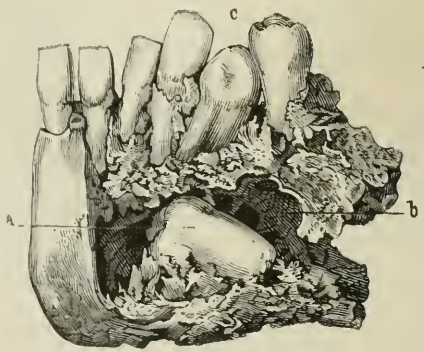


Fig. 3

PLATE II.

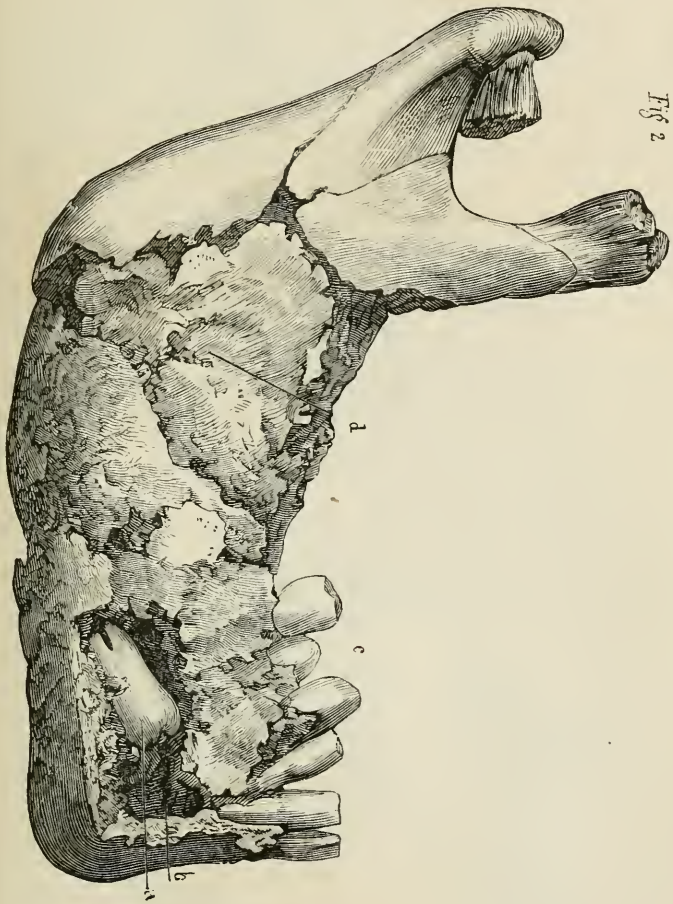


Fig 2

PLATE III.

ANOMALIES IN POSITION OF THE TEETH.

FIG. 1.—*a*. Incisor tooth retroverted, and directed toward the intramaxillary symphysis.

FIG. 2.—*c*. Canine tooth developed in the thick part of the floor of the nasal fossæ, where it forms a prominence: the root is directed forward.

b, *b*. Section of the maxillary sinus.

d. Nasal spine.

a, *a*. Posterior edge of the nasal fossæ.

FIGS. 3 AND 4.—Two other examples of anomalies in the position of the teeth.

PLATE III.

Fig. 1.

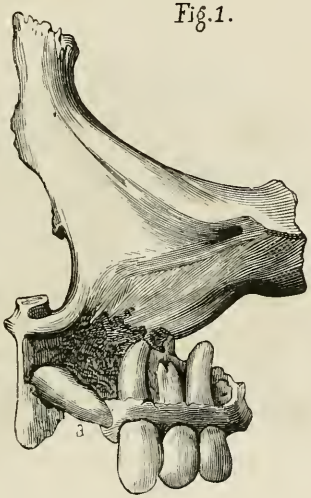


Fig 2.

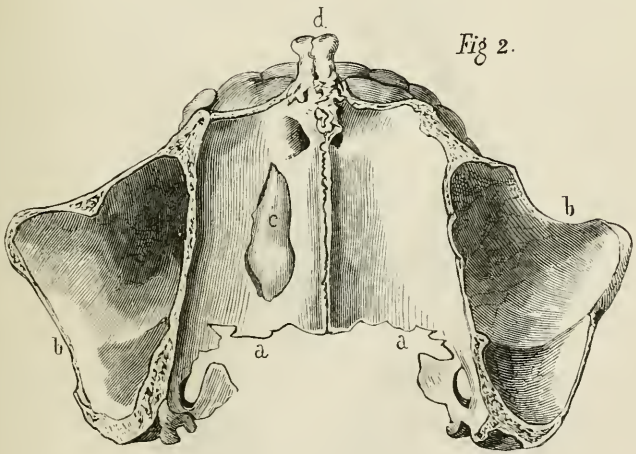


PLATE III.

Fig. 3.

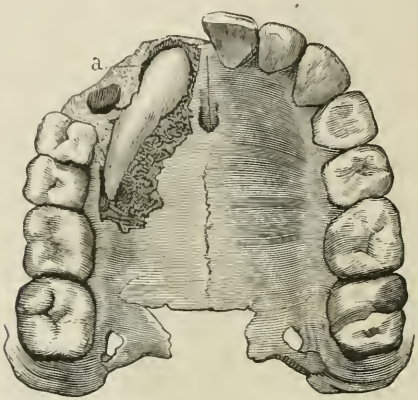


Fig. 4.

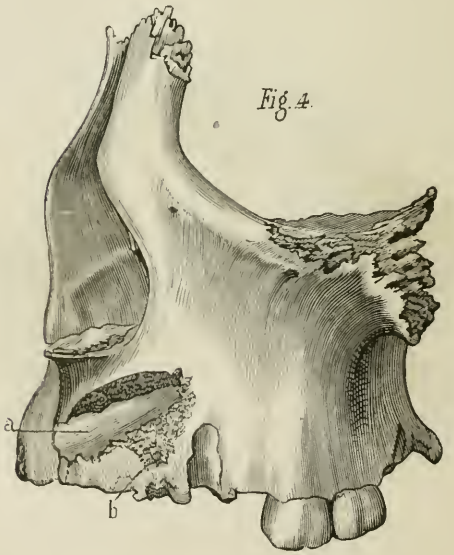


PLATE IV.

FIG. 1.—*a*, *a*. Second grinding tooth of a horse, natural size, with considerable development of the roots, transformed into two spheroidal swellings.

b, *b*. Portions of the maxillary bone sheathed in the tumor, and broken in its extraction.

c. Orifice conducting to the interior of an intradental cavity.

d, *d*. Circular groove corresponding to the alveolar arch, and forming a sort of strangulation between the tuberosity *a* and the swelling *e*, which is underneath.

f. Inferior surface of the crown of the tooth.

FIG. 2.—*Microscopic examination of the tumor* (300 diameters).—Represents part of a thin section of the tumor shown in Fig. 1. The tumor was formed jointly by a hypertrophy of the dental ivory and a hypertrophy or exostosis of the cement, the greatest part being formed of the substance of the cement.

a, *b*. Represents the ivory in its canaliculi—not ramified in this section—and terminating near the union of the ivory and enamel.

c, *d*, *e*. Exhibits the mammillated arrangement seen in the cement at certain points of the surface of union with the ivory or dentine. This arrangement, often very elegant under the microscope, is also met in the normal teeth.

g, *h*. Osteoplasts, or characteristic cavities of the cement. They are especially remarkable for their size in all the preparations taken from this piece.

f. Proper substances of the cement, or bone, in which the characteristic cavities are excavated. It is here, as always, homogeneous; little transparent, except when it is reduced to very thin laminæ.

PLATE IV.

Fig. 1

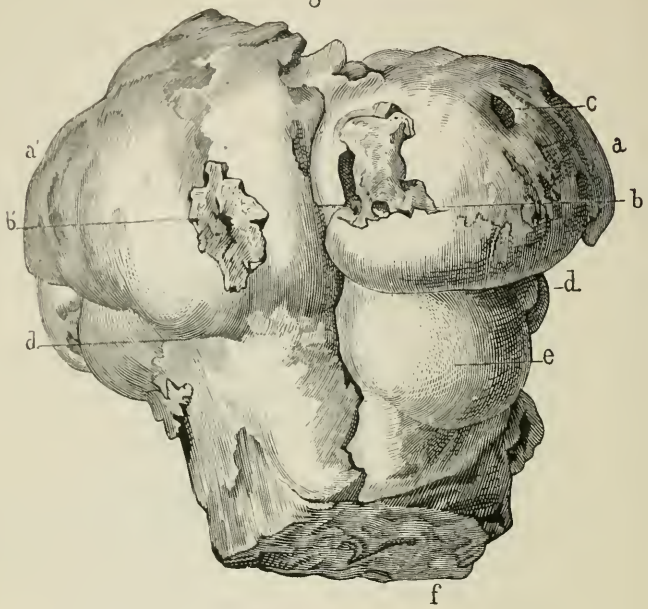


Fig 2.

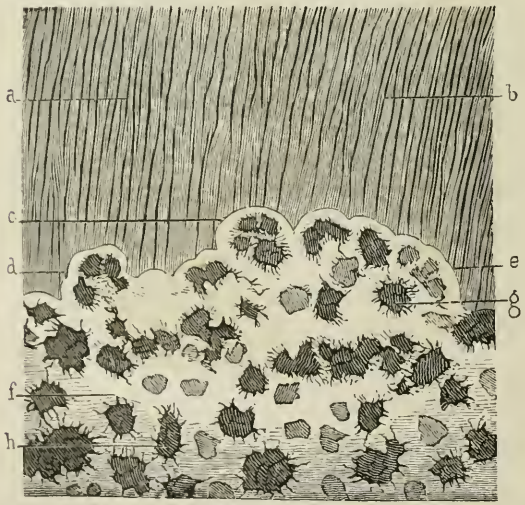


PLATE V.

Fig. 1

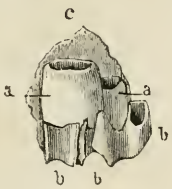


Fig. 2

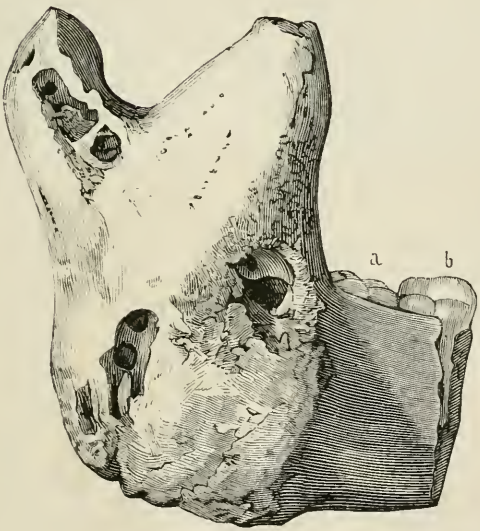


PLATE V.

FIG. 1.—Intramaxillary bone bearing the two permanent incisors (*a*, *a*) superposed, and exhibiting an anomalous development. The alveoli of the same infantile teeth are partly destroyed; this section formed the deposit.

FIG. 2.—Tumor of the ramus of the inferior maxillary bone, affected with mollities ossium. At the surface are many openings of encysted abscesses; and the last molar, the crown of which extends slightly beyond the alveolar edges, and is developed in the thick part of the base of the coronoid apophysis.

FIG. 3.—Section of the ramus, showing the numerous abscesses that exist throughout its whole extent.

PLATE V.

Fig. 3

CHAPTER VII.

THE TEETH AND THEIR DISEASES.

ALVEOLAR ABSCESS.

Periodontitis or inflammation of the alveolo-dental periosteum (considered in the previous chapter), when not successfully combated, has as its termination alveolo-dental abscess. To this condition, as a distinct one, I may now direct attention.

Alveolar or dental abscess is of course the history of an inflammation and suppuration anywhere in the body, having nothing peculiar to its history, except as such peculiarities associate with the anatomical characteristics and influences of the parts involved. It is a condition in which a tooth, diseased to the suppurative point in its enveloping membrane or periodonteum, is discharging, through some convenient orifice of exit, pus secreted by or formed in such membrane.

The local features of such an abscess may be described in a very few words. At the apex, or somewhere about the root of the affected tooth, a degenerative thickening of the membrane occurs, the old pyogenic membrane. This, in its unhealthy condition, fails to organize the lymph constantly exuded or effused by it. The degeneration of this lymph is pus. As such membrane grows thicker and thicker, and such pus accumulates, it becomes evident that space and vent are made necessities; thus absorption, through the pressure, is secured, and the matter, sooner or later, finds egress, giving generally that peculiar fistule in the gum, called parulis or gum-boil; the most vulnerable wall of the surrounding osseous parietes yielding first, thus giving the direction and locating the fistule.

The formation, and confinement of pus, in a cavity so obstinately closed as the alveolus of a tooth, must necessarily inflict the severest suffering, and such pain is so constant an attendant of the condition, and is of such almost unbearable character, that any means calculated to abort or limit its persistence is to be hailed as a boon. I take it for granted, judging from observation, that it is the severest

form of odontalgia. The condition of acute pain, however, is confined to the period intervening between the acute inflammatory attacks and the escape of the pus, the period, properly speaking, of periodontitis. An alveolar abscess fully formed, pain is limited to soreness. The cure of the perfected alveolar abscess is very simple, at least, as the indications are concerned, consisting in the breaking up of the cyst and sac, and exciting an action of sufficiently healthy character to fill with organizable granulations the fistule.

The appreciation of the treatment of alveolar abscess, begins of course with the treatment of the acute periodonteal trouble, of which it is seen to be simply a result. This was considered in the previous chapter, leaving us here nothing to add, except that if such means as were recommended fail in securing resolution, the more formidable are to be brought into requisition.

As periodontitis is so frequently aborted by scarifying the gums freely and deeply, and, after the congested vessels have relieved themselves, constringing the parts by applications of strong tinct. of iodine, so alveolar abscess can very frequently be aborted by the following trifling operation:

With a sharp scalpel make a slight cut through the soft parts at the apex of the affected tooth; next take up a spear-pointed drill and pierce through the outer plate of the bone into the cavity in which the sac is being developed, break up this sac, and, by means of a delicate tent, keep the wound patulous for a few hours.

This little operation is, I believe, original with myself; indeed, I do not know that it ever has been performed even yet by any one else; but I am well assured, through a pleasant experience, that it very commonly spares the patient upon whom it is practiced days of the excruciating torture which belongs to the formative stage of this disease. The philosophy of the operation will, I think, be at once recognized.

I cannot here help excepting to the common practice of ordering blisters and warm fomentations to the face in incipient abscess; the practice is very objectionable, and not unfrequently results in scars which much deform the patient. If the practitioner should not desire to adopt the operative suggestion I have offered, let him order a roasted fig or raisin directly to the affected part; either of these will do equally well the work of the blister or poultice. Leeches, general blood-letting, vigorous antiphlogistic medication, any and every means that promises any good, should come between the periodontitis and the abscess.

The anomalies of alveolar abscess, if such a term might be applied to conditions not at all infrequent, may, perhaps, be best studied through the medium of examples. I select a few from my own practice and that of others. If, happily, they may serve to throw light on any obscure case at present bothering some young practitioner, I shall feel well repaid for the trouble of collecting them.

A few years ago I saw, in consultation with a Dr. B., of this city, Mrs. ——, who had been afflicted with a running ulcer at the apex of the chin for four years. During this period the lady had been under the care of some five or six different practitioners, and had twice been operated upon for supposed disease of the bone.

Suggesting that the origin and cause of this fistule might be found in some diseased tooth, I was assured that these organs had been most carefully examined, and that there was not an unhealthy tooth in the mouth.

A superficial examination seemed to verify the truth of the assurance. Not satisfied, however, by such examination, with a steel instrument I commenced striking each tooth separately; the patient thought that in the left inferior lateral incisor she experienced a sensation differing from that of the others.

Placing her now in the full sunlight, I reflected the rays over the teeth by means of a hand-mirror; this test satisfied me that the incisor alluded to had lost its pulp—it showed a slight opacity.

I was now convinced that the disease was alveolar abscess, and predicated on my examination that an opening made into the affected tooth would discover the death of its pulp; this was done, and the tooth found dead, as anticipated. The offending organ was extracted, some necessary local attention given the sinus, and the patient was well in a week.

Comment on this case scarcely seems necessary, and yet it may not be amiss to suggest the explanation of the deceptively healthy appearance of the dead tooth.

When the pulp of a tooth dies, discoloration of the enamel is the common result, this discoloration being caused by the absorption of the dead matter by the tubules of which the dentine is made up. Occasionally, however, the opacity is so slight as to be scarcely perceptible, and this depends on the dense character of the tooth—not unfrequently the tubules being so occluded as to destroy their capillarity: the dead pulp is not therefore taken up. A very vascular tooth, having a dead pulp in its cavity, will soon be turned almost black.

A dead tooth, however, can always be distinguished by the tests which I have given.

The pathology of this case may be summed up very briefly. The death of the pulp provoked periosteal difficulty. The inflammation, uncombated, resulted in alveolar abscess. The pus, after inducing by its presence the absorption of the bone, dissected its way under the soft parts down to the apex of the chin, where it discharged itself—the abscess passed into the chronic stage; the annoying and formidable fistulous ulcer was of course, because of its character, rendered incapable of being healed by any directly local treatment, or that not addressed to the true seat of trouble.

In another consultation saw Miss B——, a young lady, nineteen years of age. In this patient, a fistule in the very center of her hard palate had existed for some two years, giving rise to great uneasiness (as it had refused to yield to much treatment), a cancerous cachexia existing in the family.

The denture in this mouth was also so complete as not to have attracted observation, every tooth being perfect, with the exception of a single molar, which tooth had a small filling of gold on its grinding face. The filling in this tooth was removed, and the pulp found dead. Extraction was resorted to, and in three or four days all discharge had ceased. On the sixth day the patient was dismissed cured.

It is not at all uncommon to find the sinus of an alveolar abscess venting itself somewhere on the cheek. This is too frequently the result of inviting the matter to the surface by the warm applications made to the side of the face. When pus thus seeks the surface it should be vented from the inside. The operation is very simple, and will be successful if the pus should have found its way even so far externally as to have but the skin between it and the atmosphere. Care must, however, be taken not to wound the facial artery or the duct of Steno.

Abscesses, associated with the wisdom teeth, sometimes vent in the parotid region; in these cases it is not uncommon to find the orifice of the fistule as low down as the clavicle, the unyielding character of the parotid fascia—a continuation, as it will be remembered, of the deep cervical—compelling this lengthened dissection.

Another, and indeed very curious result of alveolar abscess, is the formation of osseous cysts on the side of the jaws; the pus instead of inducing the ordinary absorption, is provided for by the expansion of the outer plate of the bone. These cysts give no sense of fluctua-

tion or crackling on pressure; there is no appearance of surrounding inflammation, the soft parts covering them do not differ, in any respect, from the adjoining tissue. I have found such cysts or tumors generally associated with teeth in which the pulps have been destroyed and the fangs filled with metal. They form sometimes very rapidly. I have treated them where the cyst has enlarged to the size of a hickory-nut in a single week. This rapid growth is particularly diagnostic.

The easiest treatment is of course the extraction of the offending tooth; but they may also be readily cured by opening them transversely and stuffing the cyst with lint, saturated with tinct. of iodine, or some other stimulant; the cyst is thus obliterated, and the sac at the end of the fang destroyed, through the healthy inflammation which the treatment excites.

These tumors are not to be confounded with other encysted tumors, of which mention will hereafter be made.

Mr. Smith, in illustrating a lecture on alveolar abscess, notices the following cases from his practice:

A few years ago, he says, a middle-aged man asked his opinion about a fistulous sore which opened on the middle of his whisker of the right cheek. Mr. S. introduced a probe, and finding that it came in contact with the fang of the last molar tooth of the upper jaw, persuaded the patient to allow him to extract it, on the promise that he should be well in a few days. On the tenth day the gentleman wrote, by post, to say that the discharge ceased the day the tooth was extracted, and that at the time of writing it was perfectly well.

He relates the case of a young woman who came under his charge at the infirmary, with a fistulous sore in the fore part of the throat, within an inch of the sternum. It had been discharging upwards of a year. On probing it, the instrument could be passed in the direction of the molar of the lower jaw on the left side. On inquiry, the patient said that eighteen months before she had a tooth drawn, but the fangs had been left in the jaw. Afterward an abscess formed, which descended lower and lower until it burst midway between the sternum and pomum Adami. Mr. S. extracted the stump, it still discharged for a week, when it got well without other treatment.

Mr. S. alludes also to a case where a horse had been condemned to the knacker's yard, as being afflicted with the glanders, having a foul, offensive discharge of purulent matter from the nostrils, and being in the last stage of emaciation. A veterinary surgeon, finding

that it could not masticate its food, examined its mouth, and detecting a carious tooth in the upper jaw, extracted it. The discharge ceased; the horse soon began to thrive, and got well.

Mr. Fleischman (*British Medical Journal*) relates the following example: "Miss Rose S, a little girl, aged five years, had been troubled about three months with a constant, though not profuse, discharge of slightly-purulent mucus from the right nostril; it appeared to be the sequel of a cold. The mucous membrane, so far as it could be examined, was healthy, and there were no indications of any morbid growth. She was ordered a strong injection of gallic acid, and took, concurrently, small doses of the sesquichloride of iron. The only advantage she derived was that the discharge lost its purulent character; in amount it remained about the same, though the treatment was long persevered in and other local astringents tried. I suspected," says Mr. F., "there must be some undiscovered local irritation. Not being able, on careful examination, to find anything wrong in the nasal passages, I looked to the condition of the teeth, and finding the right upper canine carious, removed it. The discharge was much lessened on the next day, and in the course of a day or two disappeared altogether."

Mr. Fleischman, although he does not see that his case is simply one of alveolar abscess,—but offers it as "a good illustration of reflected irritation,"—truly remarks that it "teaches us that the *fons et origo mali* is not always just where we might expect to find it."

I have had, in my own practice, several cases where the pus of an alveolar abscess discharged itself from the nares; but the disease, in every case in which I have seen it, where the sinus passed in such direction, was associated with the central incisor teeth.

Abscesses of this nature are not unfrequently associated with the eruption of the wisdom teeth. The arch being too small to accommodate the advancing organ, it becomes, as a matter of necessity, an agent of irritation; inflammations of the most severe nature are thus oftentimes provoked, inducing, too commonly, trismus and abscess. (See chapter on *Trismus.*) Abscesses from this cause generally discharge about the neck of the tooth; they may, however, void themselves in other situations, as, for example, upon the face or neck. A case illustrative comes this moment to my mind:—Dr. D., a medical gentleman, suffered for some time with heavy, dull pain in the right half of his lower jaw, and which was attributed to two of his teeth, much decayed, but which, however, had been treated and plugged. Inflammation of a severe character finally developed,

and, in defiance of all treatment, ran on to abscess, which abscess discharged upon the cheek. The pus voided, of course relief was obtained. The sinus, however, continued to discharge, and, at the time of my being consulted, the ulcer had become a source of much annoyance as well as deformity. This case had been examined by various friends of the gentleman, and while all pronounced it alveolar abscess, all associated it with the treated teeth. The removal of a developing wisdom tooth, a single cusp alone of which presented, caused the fistule to heal in a single week. (See chapter on *Odontalgia.*)

CHAPTER VIII.

THE TEETH AND THEIR DISEASES.

TRISMUS.

In the chapter on Dental Anomalies, I alluded to the process of maxillary enlargement, and exhibited how that process was, in part, counterbalanced by an untimely extraction of the deciduous teeth. I further showed how certain derangements of the dental organs were a common, if not a necessary, sequence to such abridgment of the arch; and, among other ill effects, referred to the impossibility of a natural and healthy evolution of the wisdom teeth, and to the conditions favoring periodontal inflammation.

In this chapter we are to consider lock-jaw entirely, as it has a local signification, and even, so far at least as a few paragraphs are concerned, more exclusively than this, as it has alone a surgico-dental signification.

Such surgico-dental signification, however, will, I apprehend, outside of tetanic conditions, be found to have the widest relationship to the lesion, and, indeed, if my experience has not been uncommonly one-sided, it will be found to have the very closest relationship; for, I incline to think, that in every twenty cases of local trismus, eighteen has, as the primary lesion, periodontitis in some of its varied forms.

We have considered the retraction of the dental arch. We will now look at such lesions as this retraction has engendered—lesions pertaining to the subject we have now under consideration.

The troubles of an individual afflicted with a contracted dental arch are most apt to begin at about the fifteenth or sixteenth year of age. If you look into such a mouth you will find the teeth crowded together in most uncomfortable-looking positions. The last molar of the lower jaw you will see, most likely, jammed into the ramus; while the same tooth of the superior jaw will be found occupying the very extreme of the tuberosity of the bone.

At this period—unless, fortunately, the teeth are possessed of un-

common resistance—you will find them breaking down from approximal caries; while, as the result of such caries, combined with the crowded condition of the fangs, the alveolo-dental periosteum enters into the subinflammatory state, and becomes as ready to put on acute disease as is the tinder to take the spark.

If, then, interference with the elongatory process has been such as to yield these troubles, when only twenty-eight teeth have erupted, is it not plain to infer that the development of the four dentes sapientiæ must proportionably add to these difficulties? Of course it is very plain, and only by appreciating the character of such trouble can we fit ourselves to abort its lesions.

These lesions are periostitis, alveolar abscess, stomatitis, ostitis, necrosis, trismus, etc.

In the chapter on Anomalies, I remarked that all dental troubles arising from retraction and diminution of the maxillary arch could be provided against by a timely extraction of certain of the permanent teeth; and from this we might infer that trouble arising from an advancing wisdom tooth might also be provided for on the same principle, namely, by extracting the second molar, thus providing the required alveolus.

These pathological conditions, and the remedial and prophylactic indications so plainly written over them, it would seem impossible, because of their very simplicity, to overlook; that they are overlooked, however, is too evident, from their many secondary lesions which the surgeon finds himself constantly called upon to treat.

I advanced the view that the majority of the cases of trismus would be found having, as the primary lesion, some periodontal trouble. Of course I would be understood as not including trismus neonatorum, or any trismus traumaticus, the lesion of which was self-evident. A child might get a severe burn on the cheek, and trismus be the result of the inodular tissue, which would close up the break in the continuity. Anchylosis might exist, the sequence to articular disease. Traumatic tetanus, affecting the muscles of the jaw, would have a primary lesion combined with peculiar nervous disturbances, which would give the diagnosis But it is to the numberless cases of so-called idiopathic trismus I allude, and to the cases of trismus which have evidently alone a local signification; that signification not being always very evident, or otherwise associated with so many complications as not to seem distinguishable.

We read in reports of case after case of local trismus,—of the

lesion being referred to this cause and the other cause,—the treatments being as various as the diagnoses. Many of the inferences thus presented are, without doubt, just and reliable; but I would give it as my experience that where, personally, I have had the opportunity of seeing such cases as would seem to be their parallel, I have mostly been able to point out to the practitioner exhibiting the case, as the primary lesion, some dental disturbance, simple or obscure.

In the epitome of Braithwaite, page 191, vol. ii., is a case, the diagnosis and treatment of which will serve as an example. Dr. Sellers, the practitioner who reports it, ascribes the trismus to a complication of inflammatory and nervous derangements. Now, while I might have found myself wrong, yet from the history, and from the age of his patient, I should have expected, had I seen the case with him, to have been able to have pointed out that the ulcerated sore throat, to which he alludes, had its primary in a periosteal trouble of the alveolo-dental membrane; let the reader, however, draw his own inference. I will compare with this case one from my own practice.

Dr. Sellers' Case.—*Acupuncture in Protracted Lock-jaw.*—The patient, twenty-five years of age, unmarried, had for years been subject to attacks of suppurating sore throat, in which the jaws often became nearly immovable for two or three days before the discharge of matter. In 1826, she had a severe attack, from which resulted complete lock-jaw, accompanied with hysterical symptoms, which attack yielded, after six weeks of treatment, so far that she could put a teaspoon in her mouth. After nearly a year, the jaw again became completely fixed, without accompanying sore throat, and the same treatment, with galvanism, was tried without effect. Although unequivocally connected with hysteria, there was reason to think, from the inflammatory action with which the disease set in, that the affection was not purely spasmodic, but was kept up by the rigidity of the muscles closing the jaw produced by inflammation; in consequence of which the antagonistic muscles had become inadequate to the effort of opening the mouth under the mere influence of volition.

It was this view of the case which made Dr. Sellers think it more reasonable, in making trial of the needles, to insert them into the muscles opening the jaw, in the expectation of exciting them to such a contraction as might overcome the rigidity of their antagonists.

On each of the two following days two needles were inserted, one on each side of the mesial line between the chin and the hyoid bone, the effect being short, convulsive efforts. The teeth began to grate on each other, and the jaw was drawn from side to side, not by single alternate contractions, but by severe convulsive movements on one side, followed by a nearly equal number toward the other side, interrupted occasionally by a momentary opening of the mouth to the extent of about two fingers'-breadth.

The convulsions continued after the needles were withdrawn; ceased and became renewed again after a few minutes, and returned spontaneously in the evening on both occasions. Some increase of voluntary power over the jaw followed both applications of the remedy. After each trial of the acupuncture some improvement was observable; but, as the spontaneous convulsion was almost always followed by a slight loss of motion, the progress made was slow.

The needles were usually inserted to the depth of half an inch, and sometimes to the depth of an inch.

The acupuncture, together with leeches, was used for ten days, by which time the patient could open the mouth two fingers'-breadth and chew soft substances. She then went into the country for five weeks, by which she derived great benefit; but, being exposed to cold and wet on her return, had another severe attack, the consequence of which was the loss of much of the voluntary power over the muscles of the jaw. The needles were again resorted to with the same effects as before; but the pain produced by the convulsions was greater, and lasted longer, while the spontaneous convulsion recurred several times in the evenings after each of the first trials. As leeching did not succeed in mitigating the convulsion, the temporal artery was opened with the desired result, and with the effect at the same time of restoring, to a considerable extent, the sight of the right eye, which she almost lost with the first attack of lock-jaw. A second detraction of blood from the same vessel diminished the force of the convulsion so much as to permit the acupuncture to be used twice a day. Nine days after the renewal of the operation, the jaw had recovered its natural extent of motion.

The aphonia, which had come on at the same time as the affection of the eye, was completely cured by a smart shock of electricity.

The case I referred to, as from my own experience, occurred in

the practice of a friend,—my relation with it being in a consultation. Its history is as follows:

For a period of several years the patient, Mary C., twenty-four years of age, had been troubled with attacks of sore mouth and throat whenever she unduly exposed herself; these attacks had always associated with them partial loss of voice and general excitation of her whole nervous system, while her jaws were invariably stiffened to a greater or less extent, according to the severity of the attack.

On each of these occasions she had depended for relief upon domestic treatment or homœopathy. At the period, however, of her coming under the care of my friend, Dr. W., she was suffering from such severe trouble as to decide her usual attendant into dismissing the case. Her jaw had remained so firmly locked for a period of six weeks that it was with difficulty a knife-blade could be introduced between the teeth. This particular spell had come on as usual; but the patient said there was something about it which made her think that her teeth were implicated; she could not say what tooth or teeth, but thought it was one or more in the lower jaw.

Now, whatever was to be discovered as the primary lesion in the case, its surgical feature, as it presented itself to our attention, was an extra-capsular mass of coagulated lymph about the tempero-maxillary articulation, which overbalanced the influence of the depressor muscles, holding of course the parts in a state of false anchylosis.

I asked the patient "if, when these attacks came on, her face had not always swelled more or less?" She said that "it had." I asked her "if the cheek had not always a stiff, hard feeling in it, which wore away gradually after such attacks?" "It was so," she told me.

Dr. W., agreeing with me that the speediest way of overcoming the trismus was by mechanically breaking up the adhesions, I procured a pine stick about a foot in length, tapering, wedge-shape, from an inch and a half base. The thinnest portion of this wedge was, after much trouble, passed between and across the dental arches, and, after being forced a little further on, the stick was turned on its axis, the adhesions yielding before the strain. Thus the mouth was opened at least an inch, and we were enabled to explore this cavity for the lesion upon which the trouble depended.

So far this case will be seen closely to similate that of Dr. Sellers —sore throat, aphonia, hysteria.

Now, here we found all the trouble emanating from a wisdom tooth projecting, as it were, from the very angle of the jaw, and half covered in by an operculum of gum drooping over on it from the ramus. The tooth of course we at once removed. We dismissed the patient for the day, after directing a sorbefacient external application.

The next afternoon, at four o'clock—no inflammation having supervened—we completed, by our mechanical appliance, the unlocking of the jaw. In a week the patient was dismissed well. She has since had no return of her spells, and I am perfectly sure will not have.

I think a parallelism between these two cases will be recognized, but should the reader disagree with me, the study of them will not, I trust, be without its profit.

One of the most severe cases of inflammation of the mouth, throat, and face, combined with a bad trismus, I have ever seen, was in the person of a medical student in the office of a Dr. C., of this city—the primary lesion being such a half-erupted wisdom tooth as I have alluded to as being found in the preceding case. This patient, when I first saw him, had been suffering for two or three weeks. The operculum of gum had been split up on two different occasions. Antiphlogistics in every form had been resorted to. The patient came to me under the anticipation that nothing could save him from necrosis of the angle of the bone.

I gave this man one and a half pounds of ether; it seemed impossible to get him into an anæsthetic condition, his physical suffering was so great. Prying his mouth open, just sufficient to introduce the key of Garengeot, I extracted, with much difficulty, the offending tooth. In three days he was again attending to his studies.

This peculiar lesion of a half-erupted wisdom tooth may well claim a moment's attention. Many a practitioner has been so deceived by the anomaly as to have been led widely astray in the study of his cases.

Where this condition exists, you will notice, by looking into the mouth, that only the anterior face of the tooth has fairly erupted, the other two-thirds being overlaid by the integuments of the ramus. You infer that the development is not yet perfected, and consequently it does not even strike you to associate disease with the parts; but this tooth, a single cusp of which only is through the gum, may have caries extending into its pulp-cavity, or may be the seat of the most aggravated periodontitis. It is the common im-

pression that wisdom teeth decay early; that they are not a substantial class of teeth. The fact is that four-fifths of the wisdom teeth which decay so early, have been destroyed by this operculum of gum. The explanation is very evident. The decomposing epithelial scales, and other debris of the mouth, combine in the acidity of their reaction to irritate the bony structure of the tooth, thus quickly destroying its integrity. I am sure that I have seen more than a thousand cases illustrative of this fact; and if any practitioner will take the trouble to dissect off this fleshy lid—the proper treatment, by-the-way—and examine with a delicate probe the sulci of the tooth, in nine cases out of twelve he will find caries.

Such a lesion will at once be recognized to have important surgical relations. For example, I have been consulted time and again by persons who have been sufferers for a considerable period from what has been pronounced and treated as neuralgia. Their teeth had not escaped observation, but had been examined and pronounced sound. I have found in such mouths not unfrequently this operculum of gum overlying the wisdom tooth. This I have dissected off, exposing compound caries. I have extracted such teeth, and the patients have been instantly relieved of their neuro-odontalgia.

Again; these fleshy cups, catching and holding, in contact with the soft parts, insoluble particles, as often found mixed with the food, will provoke periostitis, or even ostitis of the angle and ramus of the jaw. I have seen the most alarming inflammatory attacks thus provoked. The tooth in these cases, as I have somewhere else remarked, will alway respond to the stroke of an instrument. Its periosteum being inflamed, common sense would direct that a tooth so diseased should be at once extracted; but such extraction is occasionally among the almost impossible things. A tooth so affected will not unfrequently have but a point erupted not larger than the head of a pin. In these cases the best thing that can be done is to extract the adjoining molar; this relieves the pressure on the ramus of the jaw, and gives room for the posterior tooth. It will commonly yield a cure.

Trismus depending on such lesions is not unfrequently the only external evidence yielded by the inflammatory attack. The jaw stiffens and relaxes, as an odontalgia will come and go. In such ephemeral cases it is not at all unlikely that the trismus is exclusively a nervous action, or reflected irritation to the motor branch of the trifacial,—slight local inflammatory action being the irritant.

Wisdom teeth erupt from the seventeenth to the thirty-fifth year; generally, however, at about the twentieth year.

Some years ago I treated a case of trismus, the history of which is as follows:

The patient, David B., a farmer, after doing a hard day's work, and getting himself much overheated, threw himself, just at early evening, down in a cool outhouse to rest. Here he fell asleep, not waking until near midnight. The next day he felt a soreness in the left superior alveolar arch, which soreness increased for two or three days; after which it deserted the teeth and passed to the antrum. Then commenced a swelling in the integuments of the face, which advanced until it shut up completely the left eye. The jaws began to stiffen, and ended, after three or four days more, in complete immobility.

I was called to the case, after the lock-jaw had existed nine weeks, the patient having barely been able to support life by putting his mouth into a basin filled with soup, and sucking the nutriment through his teeth. During this time he had been seen by seven different practitioners, no one of whom had seemed to appreciate his case, or what perhaps is more probable, none of whom had been willing to assume the trouble of it. The patient had never told any of these gentlemen about the soreness first felt in his teeth, and no one of them had ever questioned him in this direction; his single complaint was of a great weight about his cheek.

The diagnosis of the case was, primarily, periodontitis; this inflammation, by a double continuity of structure, had extended into the maxillary sinus, and to the integuments of the face. The inflammation of the antrum had been sufficiently severe to have resulted in abscess; abscess of the alveolo-dental membrane, or of the lining membrane of the cavity. The inflammation of the face had resulted in the exudation of lymph, which lymph in a state of coagulation was the cause of the trismus.

A first effort was directed to getting into the antrum, which I felt well assured was filled with pus. This was done by prying out the second molar tooth with an elevator, pushing it into the mouth (from which, with some trouble, it was afterward gotten out); the extraction was followed by profuse discharge. The patient described the relief as being immense.

I removed this particular tooth, not because it was more carious than its fellows, but because it was somewhat loose, and thus gave evidence of the diseased condition of its periosteum. Again, it is through the alveolus of the palatine fang of this tooth that we find

our easiest and best road to the antrum; in this case, as is seen, the fang communicated with the cavity.

On the day succeeding the evacuation of the abscess, the patient expressed himself as entirely free from pain, his only trouble being the trismus, which had not, as yet, relaxed in the least.

To the touch, all the parts about the articular extremity of the inferior maxilla seemed completely indurated. I hesitated to attempt the breaking up of the parts mechanically, fearing that thereby I might do injury to the important vessels which are associated with the head of this bone,—the internal carotid, and internal maxillary arteries. The induration was of course extra-capsular, and was of sufficient extent to have bound the jaw from the glenoid cavity to the anterior border of the masseter muscle; passive motion was resorted to, but employed very gently. Leeches, blisters, and sorbefacients were depended on,—the case progressed very slowly, the patient having to come to my office every day for fifteen days; at the end of this time, but after removing other diseased teeth from his mouth, he was dismissed cured.

When one is called to a case of trismus of any standing, the anchylosis being the result of inflammatory action, questions may arise as to the propriety of mechanically breaking up the adhesions. The condyloid extremity of the maxillary bone is assuredly not the stanchest part of the body, and there are anatomical relations which it would not be at all pleasant to disturb,—these things are for the surgeon to decide upon. So far as I, individually, am concerned, I now use mechanical force in all cases that come under my care, premising of course that the case is one, where, from inflammation, the trismus depends on effused lymph. I am willing to run the risk for the great and immediate good yielded; some considerable experience in this direction assuring me that the risk is materially influenced by the manipulations. Of course I do not mean to recommend that attempt should be made to open the mouth to its greatest capacity with a single turn of the lever employed, although there are cases where such practice would be very commendable. I have so opened the mouth many a time, but not in cases of long standing. Generally, the force should be applied with gentleness, gain a little one day, and a little the next; it takes but a very short time to open a mouth in this way; besides, if your force is applied with such judgment as not to provoke inflammation, you will arouse to co-operation the absorbent system, the excitement acting as a stimulus to it, and it will be found to do its part vigorously.

A person will not unfrequently be attacked with trismus after the dental operation of inserting a pivot tooth. Here the lesion is inflammation, and the treatment is to be directed accordingly; the root of the tooth is in a state of periodontitis.

A person will sometimes be attacked with trismus after the operation of plugging a tooth with metal; the attack comes on suddenly; it is a reflex nervous action. The conducting facility of the metal irritates the nerve periphery in the pulp; this irritation is referred to the Gasserian ganglion, and thence reflected to the muscles of mastication. To prove the existence of this lesion, direct the patient to hold cold water in contact with the tooth.

To treat a case of this kind, remove the metal; when the irritation has subsided, advise that before refilling a non-conducting substance shall be placed between the plug and the floor of the cavity; or, because of the thinness of the bony septum, it may be desirable to destroy the pulp.

Spasmodic trismus, very obscure, may result from the employment of two different metals in the operation of tooth plugging: galvanic action is the consequence, and the nerve is subjected to a most harassing irritation. To test for this trouble, increase the action by holding silver and zinc against the plug. This test, however, will irritate any pulp into a state of excitement, and is an admirable search warrant for obscure lesions of the organ. The treatment consists of course in the removal of the plug, and the medication, if required, of the irritated pulp.

So I might extend over many pages the consideration of dental lesions in connection with trismus. I have, however, written enough, I presume, to direct a proper attention to the subject.

To recapitulate: I suggest that most of the cases of so-called idiopathic or obscure trismus will be found to depend on conditions associated with the dental arch.

That to insure permanent relief, the treatment must include the primary lesion.

That such primary lesions as are described in the chapter on "Anomalies" are always distinguishable.

That where it is desirable to extract an offending wisdom tooth, and such extraction seems too difficult to attempt, the extraction of the tooth immediately anterior to it will not unfrequently be found to meet the indications.

That the immobility of the jaw, where acute inflammatory action exists, is to be treated on general antiphlogistic or phlogistic princi-

ples, according as it seems probable or improbable that the inflammation may be resolved.

That when the acute action has passed, adhesions are to be broken up by mechanical force carefully applied.

That mechanico-dental lesions are not to be overlooked, but to be searched for, and discovered secundum artem.

Trismus, it also must be very evident, not unfrequently exists as a result of various traumatic conditions. Thus, anchylosis has been known to result in an articulation, too long denied motion, where the jaw has been unduly kept fixed in fracture. The ordinary false anchylosis is frequently associated with such fractures, a patient being sometimes months in recovering the normal motions of the parts. Trismus from cicatricial bands, resulting from deep burns, is perhaps the most intractable form of the condition. Ulcerations, the result either of ptyalism or the cancroid affections, have sometimes resulted in a closure of the jaw entirely beyond remedy. Exostosis is occasionally a source of trismus, the articular condyle being rendered incapable of free motion.

To describe any particular treatment applicable to the various causes would be to consider such causes in detail. This, it will be found, has been done in various parts of this work, as special cases have presented themselves; such conditions will be seen to demand and employ the ingenuity and learning of the surgeon. In this connection, as an example of such an application of skill to the overcoming of difficulties, I may present the somewhat celebrated case of Dr. S. P. Hullihen, of Virginia. I think it would be difficult to find a better study:

"Miss Mary S., aged twenty, daughter of the Hon. William S., of Ohio, came to Wheeling, in the spring of 1848, to obtain relief from the effects of a very severe burn, which she had received fifteen years before. The burn was principally confined to the neck and lower part of the face, and its cicatrix produced a deformity of the most dreadful character. Her head was drawn downward and forward, the chin was confined within an inch of the sternum, the under lip was so pulled down that the mucous membrane of the left side came far below the chin, the under jaw was bowed slightly downward, and elongated, particularly its upper portion, which made it project about one inch and three-eighths beyond the upper jaw. In front there was scarcely any appearance of either chin or neck. She was unable to turn her head to either side, the cheeks and upper lip were dragged considerably downward; she could not close her eyelids;

she could not close her jaws but for an instant, and then only by bowing her head forward. She could not retain her saliva for a single instant; and, as might be expected, her articulation was very indistinct.

"She had been taken to the City of New York, some years before, for the purpose of being relieved from this deformity, and was placed under the care of two of the most distinguished surgeons in that city, who performed an operation by dissecting up the cicatrix on the neck, then raising the head and sliding up the cicatrix from its original position, leaving a raw surface below to heal up by granulation. I need scarcely add that the operation was entirely unsuccessful.

"After a careful observation of the case, it became evident that such a complicated deformity could be best remedied by performing three separate operations: one upon the jaw, another upon the neck, and a third upon the under lip.

"To remove the projection of the under jaw seemed to require the first attention. Unless that could be done the other operations, however successful, would add but little, if any, to the personal appearance of the patient. This lengthening of the jaw had taken place entirely between the cuspidatus and first bicuspid tooth of the right side, and between the first and second bicuspids of the left. By the elongation, the teeth just described were separated on both sides about three-fourths of an inch.

"To saw out the upper edge of these elongated portions of the jaw, and then to divide that part of the jaw in front of the spaces thus made, by sawing it through in a horizontal manner, so as to permit the upper and detached portion to be set back in its original position, appeared to be the only possible way of remedying the deformity. This plan I therefore adopted, and performed the operation on the 12th day of June, in the manner now to be described.

"The operation was commenced by sawing out, in a V-shape, the elongated portions, together with the first bicuspid on the left side, each section extending about three-fourths of the way through the jaw. I then introduced a bistoury at the lower point of the space from which the section was removed on the right side, and pushed it through the soft parts close to and in front of the jaw, until it came out at the lower point of the space on the left side. The bistoury was then withdrawn, and a slender saw introduced in the same place, and the upper three-fourths of the jaw, containing the six front teeth, was sawed off on a horizontal line, ending at the bottom

of the spaces before named, the detached portion being still connected, on the outer and inner sides, to the jaw below, by the soft parts.

"After having with the bone nippers removed from the detached portion the corners which were created by the horizontal and perpendicular cuts of the saw, it was set back, so that the edges from which the V-shaped sections were removed came together.

"Thus it will be perceived that this portion of jaw and teeth, which before projected and inclined outward, now stood back and inclined inward, and in its proper and original place.

"In this position the jaw was secured by passing ligatures around the cuspidati in the detached portion and the now adjoining bicuspids in the sound portion; then taking an impression of the jaw in very soft wax, a cast was procured, and a silver plate struck up and fitted over the teeth and gum, in such a manner as to maintain the parts in that same relation, beyond the possibility of movement.

"The patient declared that the operation gave her little or no pain. There was a little swelling about the chin during the first three days after the operation, but not the slightest uneasiness. In this way the case progressed; the gum healed in a few days, the jaw united strongly, and in the time bones usually unite, and the wearing of the plate was discontinued within six weeks after the operation was performed.

"The deformity of the jaw being now removed, the next thing to be done was to relieve the confined condition of the head, and the distortion of the face and neck resulting therefrom. This I determined to accomplish, if possible, after the manner of Professor Mütter in similar cases, and I accordingly performed the operation on the 31st day of July, assisted by Dr. Wissell.

"I began by dividing the skin immediately in front of the neck, about half an inch above the sternum, and then carried the incision back about three inches on each side. I then commenced a careful division of the strictures, which were so thickened in front as to extend to the trachea, and on the sides as not only to involve the platysma myoides, but a portion of the sterno-cleido-mastoid muscle also. After dividing everything that interfered with the raising of the head and the closing of the mouth, as far as the incision was now made, it became evident that, to give free motion to the head, the incision on the neck must be extended back through the remaining cicatrix, which was at least two inches wide on one side, and about an inch and a half on the other.

"This was accordingly done, the whole presenting a wound upwards of nine inches in length and nearly five in width. A thin piece of leather was now cut in shape of the wound, but somewhat larger, and placing it upon the shoulder and arm, immediately over the deltoid muscle, a flap nearly ten inches in length and five in breadth, having an attachment or neck two inches wide, was marked out, and then dissected up as thick as the parts below would permit. This flap was now brought around and secured in the wound on the neck by the twisted suture, the sutures being placed about an inch and a half apart. Between each of these sutures, one, two, and sometimes three small stitches were inserted, depending entirely upon the number necessary to bring the edges neatly together. These stitches were of fine thread, had a very superficial hold, produced little or no irritation, and served to keep the parts in better apposition than any other means I could have devised. The wound of the shoulder was next drawn together about one-half of its entire extent; the remainder was covered with lint. One long, narrow strip of adhesive plaster applied around the neck to support the flap, and over this a cravat tied in the usual way, constituted all the dressing deemed advisable at this time.

"The patient bore this tedious and very painful operation with great fortitude, and uttered scarcely a murmur. She was somewhat exhausted, but not from the loss of blood. There was no vessel divided of sufficient importance to require a ligature.

"August 1st. During the fore part of last night the patient was somewhat distressed, was very unmanageable, would talk incessantly, and occasionally sat up in bed. An anodyne was administered at twelve o'clock, after which she rested much better and slept some. Complains of sickness of the stomach this morning; has vomited three or four times; flap very pale; pulse rather weak. Directed to refrain from all kinds of drinks.

"2d. Complains only of pain in the shoulder; was much distressed the latter part of last night, on account of a retention of urine. The catheter was employed, and about three pints of urine drawn off, after which she rested well. Pulse somewhat excited; flap better color.

"3d. The patient rested well last night; the use of the catheter still necessary. All efforts to keep the patient from talking and moving unavailing; color of the flap rather pale, save at the extreme point and about two inches along the lower edge, which is assuming rather a dark-blue color. Pulse about the same as yester-

day; removed a pin from near the point of the flap, and enveloped the neck in cotton batting. Patient complains of hunger; chicken broth ordered.

"4th. Patient rested well; the use of the catheter yet necessary; complains of slight headache; the color of the flap nearly natural, and even the point is assuming a healthy hue, and appears to be uniting; pulse almost natural.

"5th. Urinates without difficulty; bowels moved by injections; patient entirely free from pain; pulse natural.

"6th. Dressing removed; the flap is uniting by the first intention along both sides, throughout its entire extent; the greater part of the pins and stitches removed.

"7th. The remainder of the pins and stitches removed; patient perfectly comfortable and cheerful.

"10th. Sat up all day by the window.

"16th. Walked out to take an airing.

"During the whole progress of the cure, there was not the slightest swelling or undue inflammation in the flap or about the neck. The patient was slightly hysterical for the first few days, but never complained of anything but pain in the shoulder, a slight headache of a few hours' duration, and the uneasiness occasioned by the retention of urine. The wound on the shoulder granulated rapidly and skinned over in about six weeks after the operation. It was curious to observe that upon touching the flap after it had healed in the neck, the patient would always refer the sensation to the shoulder or arm from which the flap was taken.

"The confinement of the head and the distortion of the face occasioned by the strictures being now removed, the next step was to relieve, as far as possible, the very great deformity of the under lip.

"The under lip, from being dragged down and greatly stretched by the former projection of the under jaw, was rendered greatly too large, so that it pouted out an inch or more farther than the upper lip. This, together with a turning out of the mucous membrane on the left side, which extended nearly down to the lower edge of the chin, making the lip too short on that side, was the nature of the deformity yet to be relieved.

"To remove this unseemly appearance of the lip, the inverted portion was cut out in a V-shape, extending down to the flap in the neck, and sufficiently large to reduce the lip to its proper size. The edges were then brought together, and secured after the manner of a single hare-lip. The wound healed in the most beautiful manner,

and the appearance of the lip was greatly improved; but there yet remained a deep depression or notch in the edge, sufficiently large to keep exposed the tops of two or three teeth, besides preventing the coming together of the lips on that side.

"I now determined to raise, if possible, this depressed portion of the lip, and for this purpose I passed a bistoury through the lip, about two lines from the free edge, first on one side of the depression, and then on the other, and then carried the incisions downward to meet at a point on the lower edge of the chin.

"The depressed portion of lip now lying between the two incisions was next dissected loose from the jaw, and then raised to a level with the remainder of the lip, and there retained by pins, after the manner of dressing a double hare-lip, the line of union forming a letter V.

"This operation was as successful as the others, and the original deformity being now removed, the young lady, though still bearing evidences of the burn, has the free use of her head, eyelids, jaws, and lips, and may mingle in society without particular note or remark."

This case, although not one, strictly speaking, for the cure of trismus, is yet, however, so analogous to certain traumatic conditions of this kind, that no special case with which I am acquainted contains as much of just that particular order and kind of operative proceeding required in this direction of surgery, and necessary to be understood and appreciated by the surgeon.

CHAPTER IX.

THE DISEASES OF THE TEETH.

CARIES.

Caries of the teeth is a chemico-vital action, and most markedly a trouble of hereditary transmission and predisposition. So true is this, that it may be prognosed that the offspring of parents afflicted in this way will be in like afflicted, and that on the other hand the children of parents possessing good teeth will be in like favored. So marked, indeed, is this analogy in the teeth of parent and child, that in most instances it extends to the very shapes and arrangement of the organs, thus deformity insuring deformity, and regularity, regularity. One parent alone may thus influence for good or evil.

Caries of the teeth, allowing for differences in structure, and consequently in impressibility, is to be viewed as most analogous to caries of the bone proper, and, consequently, is most scientifically treated as caries in bone is treated—in other words, dental caries is more a vital or constitutional, than a local or chemical trouble, or it is chemico-vital, as syphilitic caries of bone is chemico-vital, or as scrofulous caries is chemico-vital. In syphilitic, scrofulous, mercurial, or other commonly recognized dyscrasiac caries, the practitioner feels that three distinct requirements are to be met: 1. The natural forces are to be increased. 2. The specific condition is to be conquered. 3. The local indications, or the caries, are to receive local attention. In common dyscrasiac caries of the teeth, or in caries not of peculiar or special hereditary transmission, these principles of treatment are to apply; and if justly appreciated, and the constitutional condition discovered and understood, the practitioner must find that he can cure the one caries as he cures the other.

In the caries of peculiar hereditary transmission, that is, of that special something which exhibits itself alone in the direction of the teeth without any evident constitutional dyscrasia, we are to treat and hope, just as we treat and hope in the phthisis of trans-

mission. It is to be a treatment on general principles, and is compelled, too often, to be experimental. It can certainly only be differential. Unfortunately, in the one case, as in the other, medication seems to stand us to no very satisfactory end,—the lung will break down, and the tooth will break down,—it is only a matter of time, or, might I better say, a matter of an inability on our part to appreciate cause and treatment.

In connection with an inability on the part of the teeth—as the vital force is concerned—to resist deteriorating acute tendencies, we have, not unfrequently, to contend with certain direct physical imperfections, which, like the wooden horse of Troy, gives ingress to the enemy, which otherwise might have been resisted. Examination of the teeth, particularly the pre- and posterior molars, exhibits, quite too frequently, irregularities in the protecting covering of enamel, breaks in the continuity, as it were, particularly in the various sulci. In these depressions lodge and decompose the various ingesta of diet, acting, of course, as irritants, and producing, as I believe, just the same character of effect as would be produced in any bone; that is, inflammation, yet modified, of course, by differences which exist between the tooth bone and ordinary bone; it is, however, inflammation in the one case, and inflammation in the other; the matter of acids and alkalies have little to do with the matter, except as they are agents of irritation. If proof is needed of these assertions, it seems fully enough found in the resistive ability of common healthy dentine, from which the enamel has been so cut as to make the surface a self-cleansing one. Witness the filed teeth of the South Sea Islander; or, to come directly home, witness the everyday results of ordinary dental operations. One practitioner files the teeth so that the surfaces shall always present inclined planes, another wedges teeth apart, files off the enamel, in the process of getting ready a carious cavity for filling, and the operation completed, removes his wedge, and allows the exposed faces of the dentine to fall together; the one, a self-cleansing surface, remains healthy, the second, non-cleansing, soon again takes on ulcerative action or decay.

A tooth, then, may, in its vital relations, be just strong enough to resist external forces brought to bear upon it, if in its construction there is no mechanical imperfection. It may again, even with such imperfections, be able to resist injurious impressions, as is often enough witnessed.

Integrity of the teeth we shall assume to depend on two con-

ditions: inherent vital resistive power, and the absence of irritating influences. The vitality of a tooth can be elevated as the vitality of a lung is increased Irritating influences, both internal and external, can be met and combated, in the one case as in the other.

The study of the vitality of a tooth, and the study of its adverse influences is the study of vitality anywhere. The treatment is, of course, constitutional, and is to be appreciated by the practitioner if he would be successful in his efforts.

In viewing, from a systemic stand-point, the composition of the teeth, we have primarily to remark, that the component parts are formed from and preserved by that chemico-vital relationship existing between blood and parts to be nourished. We recognize, and know, that in that fluid which we denominate blood resides the element of nutrition, and that as this material is well or illy adapted to meet the requirements of the different tissues, so are these tissues found to be in varying states of health. We infer that blood, rich in the elements of tooth-structure, is capable of yielding good teeth, provided the process of similation resides to a proper extent in the part to be built up and nourished, so that the study of caries, from the constitutional stand-point, consists in looking at the condition of the blood and the amount of vital force residing in the teeth themselves.

A tooth in its composition is made up of cementum, dentine, enamel, and pulp substance. Excluding the pulp substance, we find, with some variation, the relative proportions of organic and inorganic matter to be as follows:

	Cementum.	Dentine.	Enamel.
Organic matter	29·27	28·70	3·59
Inorganic matter	70·73	71·30	96 41

The character of this inorganic material we find, by a more complete analysis, to be as follows: phosphate of lime, fluate of lime, carbonate of lime, phosphate of magnesia, salts.

The composition of healthy blood yields the following analysis:

Water	780·15
Fibrin	2·10
Albumen	68·09
Coloring matter	133·00
Cystallizable fat	2·43
Fluid fat	1·31
Extractive matter	1·79
Albumen, in combination with soda	1·26

Chloride of sodium and potassium; carbonates, phosphates, and sulphates of potash and soda	8·37
Carbonates of lime and magnesia; phosphates of lime, magnesia, and iron; peroxide of iron	4·60
	1000·00

In a healthy and normal condition of the human system we find always the existence of a relationship between the requirements and material of supply which should, and which does, afford proper tissue; where then such conditions exist, the teeth are perfectly formed, and, as constitutional relations are concerned, are healthily preserved.

In the study of the pathological conditions of these organs, we are to discover, if possible, wherein the harmony of demand and supply has been interfered with, and that we may look at the subject from the most comprehensive stand-point, we begin with that period of dental evolution in which the primary impressions are produced. In this connection, I know of no one who has given a more exhaustive attention to the subject than the late James Paul, M.D.; and I recognize that I could not afford the subject better expression than by embodying the substance of a paper read by that gentleman before the Medical Society of Mercer, N. J. The views cannot receive a too careful study.

"The subject," says Dr. Paul, "is, not only in a physiological point of view, one of interest, but in its application to the preservation of health—the tendency to improve the general condition and physical constitution of the human family inhabiting this great continent—a continent abounding, as it does, in all the productions which a bountiful Creator in his beneficence bestows on man—cannot be otherwise than of great and paramount importance.

"At a period somewhat now remote, the celebrated naturalist, Buffon, alluding to the animals of this continent, advanced the following opinions:

"1st. That the animals common both to the Old and New Worlds are smaller in the latter.

"2d. That those belonging to the New are on a smaller scale.

"3d. That those which have been domesticated in both, have degenerated in America.

"4th. That, on the whole, it exhibits fewer species.

"These opinions, Mr. Jefferson, in his 'Notes on Virginia,' undertook, and it is generally considered successfully, to controvert; yet,

however repugnant to the general idea the opinion as to the tendency of those animals which have been domesticated in America from other countries to degenerate, it is an undeniable and much to be regretted fact, that the human family, and more particularly the female portion of that family, have declined in the vigor and strength of their physical constitution.

"I wish not to be misunderstood: I say it is a melancholy fact, too well known to the observant physiologist, that increase of strength and development of frame have not been attained by the intermarrying of members of the human family of different nations on this continent; but the reverse is too observable; the physical frame of the female sex has degenerated—calling loudly for the aid of science to arrest an evil of so much magnitude.

"Let us for a moment contemplate the female form, as seen on this broad continent. In no country in the world are children more fair and beautiful; and as the young girl grows up to womanhood, we see in her a full realization of that being forming in the hands of Divinity, portrayed by the poet, as seen by Adam in his dream:

> "'Under his forming hands, a creature grew
> Manlike, but different sex; so lovely fair
> That what seemed fair in all the world, seemed now
> Mean, or in her summed up, in her contained,
> And in her looks.'

"We see this young and lovely being—the forehead well developed—the countenance, rather elongated, relieved of the harsher outline of some of the European nations—with fragile form, and small, yet well-developed bust, flitting for a few short years among us, and then—yes, then there comes a change. Ere five-and-twenty summers pass, this flower begins to fade—the rounded form shrinks—the bloom of health decays; and if she escapes the fell destroying angel's deathlike grasp, a wreck of former self remains.

"Why should this be so? The robust of other countries come to this continent—they live in comfort—their food is excellent in quality—their progeny is like themselves—but even now, in the very first generation, does the degenerating process make itself manifest—the teeth begin to decay; and girls, while yet children, have to visit the dentist to have them cleansed, scraped, and plugged.

"Now this brings us at once to the head and front of our subject; and if we can point out the first cause of this decay of what should be as strong as adamant, it may be the means of helping us in our investigation. That there is something radically wrong in our sys-

tem of rearing the young, to which this misfortune is in a great measure owing, I am free to confess is my firm opinion. I would indeed it were in my power, in pointing out the evil, to be as successful in detailing the cause, that we may apply the remedy. Still, although perhaps unable to accomplish all I wish, my observations may not be without their weight, and induce others, more observant, more scientific, and more competent to the task, to follow up an investigation so fraught with advantage to our fellow-beings.

"It is certainly to be deplored that the females of this continent, descendants of European parents, should be so much afflicted with caries of the teeth—the decay of parts formed of substances which enter into the composition of some of our hardest minerals—marble, bone-earth, and fluor-spar; and this decay unfortunately occurs in early life—in girls yet at school; and many a young woman, ere she has attained a marriageable age, has had to replace the natural with the unnatural, though more enduring enamel of the artist's formation. This ought not to be: God made all mankind alike; in no portion of the earth are nations found who lose their hands, or feet, or tongue, or eyes; and there can be no cause why the inhabitants of this land should lose their teeth. It is not so in the olden countries from whence the progenitors of the present race have come; nor is it so in the West India islands, which may almost be considered as part of this great continent. So excellent is the structure of the teeth of savage nations, that some tribes in Africa, I think the Mocoes and Mundingoes, file all the front teeth, so that they shall be separated and form sharp points, the better to tear the uncooked animal food.

"One cause of this affliction is, in the mind of many, attributed to the great and sudden changes of temperature experienced on this continent—the thermometer rising and falling 20, 30, and even 40 degrees in twelve hours. But if attributable to these sudden changes, we know that sudden expansion by means of heat, or sudden contraction by means of cold, causes the particles of which bodies are composed to tear themselves asunder; consequently to crack, break, and fall in pieces. But this is not the case with the teeth of our females; a caries or decay commences most generally in the side of the tooth, extending to the enamel, which is sometimes involved in the destruction; at other times, it is left a crust or shell to snap and break off in small pieces, when unable to resist the pressure of whatever may be placed against it; besides, the teeth are for the most part sheltered from these sudden changes, and kept

at a temperature nearly amounting to blood heat at all seasons. I do not think we can place the general destruction of the teeth, and consequent affliction of the females of America, to this cause. I fear we must rather look for it to constitutional weakness, and this constitutional weakness to a deficiency of the inorganic or earthy constituents being taken into the system, more particularly at an early period of life.*

"If I am correct in this opinion, and reason, philosophy, and a thorough examination of physiological facts in both the animal and vegetable economy, tend far to bear out these views, then if we would try and correct this lamentable state of things, let us commence at the very beginning, and make ourselves acquainted by examining the structure and composition of the teeth, and then we shall be more able to understand what is required to aid nature in their formation and consequent preservation.

"First, then, let us make ourselves acquainted with the structure and composition of the teeth. The teeth are nearly allied to bone in structure; both having earthy deposits, intermixed with fibers and cells of gelatin, which, by consolidation, gives form and strength—in the case of bone, to bear the weight of the various parts, and afford protection to the different organs of the body; and in the case of teeth, to cut and grind the food required for the formation, support, and reparation of its various parts.

"Now, teeth are composed of three different substances, and these three are disposed according to the purposes required of them; they are *cementum* or *crusta petrosa*, *dentine* (known as ivory in the tusk of the elephant), and *enamel*. The *cementum* or *crusta petrosa* corresponds in all especial particulars with bone; possessing its characteristic *lacunæ* or small cavities, and being traversed by vascular medullary canals, whenever it occurs of sufficient thickness; it is the first covering of the young teeth, and may be said to invest the fang of the tooth which enters the alveolar process of the jaw. The *dentine* or ivory consists of a firmer substance, in which inorganic or mineral matter predominates, though to a less degree than in *enamel*. It is traversed by a vast number of very fine cylindrical, branching, wavy tubuli, which commence at the pulpy cavity, and radiate toward the surface. The diameter of these tubuli, at

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* Experiments have demonstrated that teeth may be changed instantly from iced to boiling water without cracking the enamel. Injury to the teeth from thermal changes would arise rather from irritation inflicted on the pulp.

their largest part, average about 1-10,000th of an inch; their smallest are immeasurably fine; so much so, that they cannot possibly receive blood, but it is surmised that, like the canaliculi of bone, they imbibe fluid from the vascular lining of the pulp cavity, which aids in the nutrition of the tooth. The *enamel* is composed of solid prisms of fibers, about the 1-5600th of an inch in diameter, arranged side by side, and closely adherent to each other; their length corresponds with the thickness of the layer which they form; and the two surfaces of this layer present the ends of the prism, which are usually more or less hexagonal. In the perfect state, the enamel contains but an extremely minute quanity of animal matter. In the center of the tooth is the soft pulpy cavity, which affords a bed for the blood-vessels and nerves which supply it with life and sensibility.

"I shall not enter more minutely into the structure of the teeth, but may briefly state, that like all other structures of the animal body, the component parts are derived and deposited from the blood, by that mysterious and incomprehensible power that selects and deposits the necessary constituents in the formation of the several portions, according to the use required.

"Now, in the composition of the teeth, we have first the division into organic and inorganic or earthy matter; and we find that the several substances which enter into the structure of the teeth, differ chiefly as to the earthy matter contained in each.

"Chemical analysis of the incisors, or front teeth of man, shows that they contain in one hundred parts of each, as follows:

	Cementum.	Dentine.	Enamel.
Organic matter	29·27	28 70	3·59
Earthy matter	70·73	71·30	96·41
	100·	100·	100·

"These proportions will occasionally differ; in some individuals the organic constituents having less than here stated, amounting in the dentine only to 21. The analysis of bone, however, gives a much larger proportion, viz.:

Organic matter	32·56
Earthy matter	67·44
	100·

"Let us now take a more complete analysis, showing what earthy constituents enter into their composition. Analysis of the

molar or grinding teeth of man, and of the bones of the arm and leg of a man of forty, show the following proportions:

Inorganic matter:	Dentine.	Enamel.	Bone.
Phosphate of lime, with traces of fluate of lime	66·72	89·82	54·61
Carbonate of lime	3·36	4·37	9·41
Phosphate of magnesia	1·08	1·34	1·07
Salts, etc	·83	·88	2·35
Organic matter	28·01	3·59	32·56
	100·	100·	100·

"Thus we see the very great proportion of certain earths that enter into the structure of the teeth and the bone of man, the chief substance being the phosphate of lime, familiarly known as bone-earth. We find, too, that whereas in ordinary bone the phosphate of lime constitutes only 54 parts in 100, in the enamel of the teeth it is nearly 90 parts in 100—while the carbonate of lime in bone amounts to 9·41, in the enamel of teeth it is only 4·37; the enamel being literally almost a mineral in substance, having only 3·59 parts of animal matter in 100.

"Thus the teeth to be strong and durable, require a large quantity of earthy ingredients, particularly *lime*, to enter into their composition. Let us inquire whence it is derived; and for this we must examine the blood.

"To allow of such deposits from the blood, it is first necessary that they should be held in solution in that fluid. The blood circulates to every portion of the body by the action of the heart, which forces a certain quantity, say 2 oz. at every contraction, into the aorta or great canal leading from the left ventricle—the aorta divides and subdivides into innumerable branches, which are made to ramify to every part of the body, until the extreme branches end in capillary tubes or vessels, the caliber of which is so small as not to allow the red globules or corpuscles of the blood to enter them, but which allows the serous portion to traverse every part of the organized structure, holding in solution all those constituents necessary and requisite for the formation and reparation of its several parts.

"In the serous portion of the blood, then, we find contained the constituents required for the composition of bone and teeth—analysis of 1000 parts of healthy human blood giving, according to M. Lecanu, the following proportions:

Water	780·15	785·58
Fibrin	2·10	3·57
Albumen	65·09	69·41
Coloring matter	133·00	119·63
Crystallizable fat	2·43	4·30
Fluid fat	1·31	2·27
Extractive matter, uncertain	1·79	1·92
Albumen in combination with soda	1·26	2 01
Chlorides of sodium and potassium; carbonates, phosphates, and sulphates of potash and soda.	8·37	7·30
Carbonates of lime and magnesia; phosphates of lime, magnesia, and iron; peroxide of iron.	2·10	1·42
Loss	2·40	2·50
	1000·	1000·

"We see by this table, if we subtract or take away the proportion of water amounting to 780 parts, and the coloring matter amounting to 133, we shall leave scarcely 90 parts of organic and earthy material, the salts and earths forming upwards of a 10th—the salts being in proportion to the earths as 4 to 1.

"Having then shown the constituent portions of the bones and teeth to be in the blood, the next consideration is, whence are they derived?

"Before entering on this subject further, let us for a moment take a broader and more comprehensive view of what must be most interesting to mothers, and of great consequence to the well-being of the infant generation, in a short time, in a very few years, to become in their turn the mothers and fathers of another generation.

"The question then presents itself, what is the nourishment or food best adapted and necessary to the wants of an infant, that the foundation may be laid for a strong frame and vigorous constitution? For here, we must recollect, is the starting-point in by far the majority of instances. We know that in some cases disease is hereditary—that the offspring unfortunately inherits from the parents constitutional defects; but we also know that more misery, suffering, and constitutional derangement are entailed on children by want of care and improper food in the first years of life, by which their hopes of health are blasted, and they are doomed to struggle through a weary life, to be hurried at last into a premature grave.

"Now, that the frame—that is, the bones, muscles, and other portions of the infant—may be fully developed, it is necessary that it should be supplied with nourishment, containing all the constituents required for this important undertaking. And this nourish-

ment, by the all-wise ordering of Providence, is contained in the milk secreted from the mother's bosom.

"The infant is entirely dependent on the nourishment derived from its mother, and nature has wisely ordained that the secretion from the mother is its very best food; for we find in the composition of milk—that is, healthy milk, derived from healthy blood—all those ingredients we have hitherto traced as requisite in the formation of the bones and teeth, and not only these, but every constituent required for the life and growth of the individual; milk containing the albuminous, saccharine, oleaginous, saline, and earthy compounds requisite and necessary for the health, strength, and development of the infant child.

"An analysis of cow's milk gives the following proportions of the various constituents; that of human milk is not so elaborate, but contains the average of observations taken at fourteen different times from the same individual, by Simon.

Cow's Milk by M. Haidlen.

Water	873·00
Butter	30·00
Casein	48·20
Milk sugar	43·90
Phosphate of lime	2·31
Phosphate of magnesia	·42
Phosphate of iron	·07
Chloride of potassium	1·44
Chloride of sodium	·24
Soda in connection with casein	·42
	1000·

Woman's Milk by Simon.

Water	883·6
Butter	25·3
Casein	34·3
Milk sugar and extractive matter	48·2
Fixed salts	2·3
	1000·

	Maximum of 14 observations.	Minimum of 14 observations.
Butter	54·0	8·0
Casein	45·2	10·6
Sugar and extractive matter	62·4	39·2
Salts	2·7	1·6

"Now, although these amounts will no doubt vary, under every variety of circumstances, according to the *health, exercise, passions,* and *food* of the mother, yet they show that healthy milk contains all the requisites for the nourishment of the infant; but then it must be *healthy* milk, secreted from healthy blood, and that blood must derive these ingredients from the *food* consumed.

"Cow's milk differs from that of woman in the proportions of some of the constituents, it abounds more in butter, but particularly in casein, or cheese; and on the other hand, human milk abounds more in the saccharine principle, or sugar of milk. Now this points out a circumstance from which great benefit may be derived. It is of very frequent occurrence that infants are deprived of the natural nourishment of the mother, and diverse opinions are given relative to the food of infants by persons who really know very little about the matter; one recommends a milk diet, another that the infant must be fed on starch and sugar.

"Now, to enable the infant to receive a nourishment in every respect similar to the mother, the knowledge of the various proportions which we obtain by chemical analysis enables us to rectify and produce milk very analogous to human milk from that of the cow, by diluting it with water in the proportion of about half as much again; that is, to a pint of milk should be added half a pint of water that has been boiled, which will reduce the cheese principle to the proper proportion; add a small portion of cream to restore the proportion of butter, and then add sugar until the whole is distinctly sweetened, and we have a compound in every respect similar to the milk from the human breast.

"To understand the subject of nutrition, let us remember that food should, or must embody two great principles: one to nourish, the other to give heat to the body. And food, when consumed, is applied to one or the other of these purposes. Now, in the process of digestion, the constituents of the food are separated, and arranged in three classes:

"1st. All that portion derived from animal food, eggs, the curd of milk, the gluten or adhesive portion of wheat and other grain, and whatever in animal or vegetable food can be rendered into *albumen*—of which the best example that can be offered in illustration is the *white of egg*, which is in reality nearly pure albumen—and the principle is therefore called *albuminous.*

"2d. All that portion of the food derived from vegetables, starch, sugar, etc. that can be converted into *sugar* in the process of digestion. This principle is, therefore, called *saccharine.*

"3d. All the fat, butter, oil, etc. which, when deprived of the other substances, is left in the state of *oil*, and therefore called *oleaginous*.

"Now, of these three the *albuminous* is the *nutrient*, and the *saccharine* and *oleaginous* the *calorifacient*, or heat-giving; and chemicial analysis shows that they vary in composition.

	ALBUMEN.		OLEAGINOUS.
	Eggs.	Wheat.	Mutton fat.
Carbon	55·000	55·01	78·996
Hydrogen	7·073	7·23	11·700
Nitrogen	15·920	15·92	
Oxygen			9·304
Sulphur, Phosphorus	22·007	21·84	

	SACCHARINE.			
	Starch, arrow-root.	Sugar from starch.	Sugar of milk.	Cane sugar.
Carbon	44·40	37·29	40·00	42·301
Hydrogen	6·18	6·84	6·61	6·384
Oxygen	49·42	55·87	52·93	51·315

"It will be observed that the albuminous or nutrient differs from the saccharine and oleaginous, in containing nitrogen, and sulphur and phosphorus, with carbon, hydrogen, and oxygen, while the latter contains only carbon, hydrogen, and oxygen—nitrogen being required in those compounds which give strength and formation to the frame.

"Now the albuminous or nutritive, being that portion which affords nourishment to the body, contains those constituents required in the first place for the formation and giving strength to the different portions of the body, and when fully developed, of repairing the general waste continually going on in the system, whether from the usual wear and tear, fractured bones, or the ravages of disease. And the saccharine and oleaginous—the calorifacient or heat-making—to keep up a continual supply of fuel, as it were, that the body may be kept of a regular and proper temperature; for all are no doubt aware that there is a continual supply of carbon, or, in more simple language, of charcoal, required to keep up the natural temperature of the body; and what is not required for immediate use is stored away in the form of fat, to be called into action as occasion requires.

"We have seen in the analysis of milk that that fluid contains

butter, cheese, and sugar; consequently we can understand how an infant can thrive so well upon it,—the cheese or casein* of the milk, containing the nitrogenized or nutrient principle, which, together with the earths and salts contained in the milk, goes to form the bones, muscles, and the different tissues of the body,—the sugar, which we have seen by the analysis, contains a large quantity of carbon in its composition, going to keep up the temperature of the infant, while the butter, in the nature of fat, is stored away in a healthy infant, filling up every vacant interstice, causing a roundness and plumpness, the pride and joy of the happy parent.

"Now let us mark the difference of the babe that has been denied a milk diet, and is doomed by ignorance to be fed on starch and sugar. We will recollect that these two substances were composed of carbon, hydrogen, and oxygen only. By a process of digestion which I need not here enter into, such food is converted into sugar, the carbon of which becomes the fuel by which the temperature of the body is kept up—there being no principle in the food to give albumen, there is nothing taken into the stomach upon which the gastric fluid can expend its solvent powers; the infant is, therefore, much troubled with acid eructations, and the stomach becomes weak and irritable. The want of the nutritive constituent of the food, and the earths and salts, etc. necessary and essential for the formation of the bones and teeth, show a lamentable deficiency in the child's development; and there being no fatty matter to be laid up, the body is emaciated, the countenance is ghastly, the flesh and integuments hang soft and flabby over the bones; no absolute disease can be detected; the child is ravenous and hungry, and the unfortunate babe descends to the tomb a specter and an object of the most pitiful description. This is no fancy sketch, but one too often met with in the ordinary walks of professional life. And why is it so? Simply because the composition of the human frame, the component parts of our food requisite to produce that frame, and the process of digestion and nutrition, are so little understood.

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*	Analysis of casein from fresh milk.	Albuminous substances found in whey after coagulation with an acid.
Carbon	54·825	54·96
Hydrogen	7·153	7·15
Nitrogen	15·628	15·89
Oxygen		21·73
Sulphur	22·394	0·36

"We now advance from infancy to childhood—and this is a period when the greatest attention is required in supplying nutriment to aid nature in the great work of developing the body. The child is now deprived of the maternal secretion, and dependent on food prepared for its use by the hand of man,—perhaps living in a city, and deprived of pure and wholesome milk from the cow. And we know there is a vast disproportion in the quality of milk when the cow is country fed on the natural productions of the farm, and when city fed on slops and grain, the refuse of the brewery.

"It is at this age that the great proportion of bony substance is deposited; those of the extremities are lengthened, become more compact and stronger, and the substance of the teeth is deposited in the cells of gelatinous tissue. How necessary is it, then, that this subject should receive the utmost attention of parents. It has hitherto been too much the custom to leave all this, as belonging entirely to nature, as a thing we had nothing to do with. We have been too much in the habit of considering that nature furnished her own materials, and man had nothing to do with her operation. The potter cannot fashion the bowl without the clay, neither can bone be formed without earth: nature must be supplied with the material, which, although offered in the most incongruous forms, she has the power of decomposing, selecting from, and supplying for the various purposes required: one portion, as we have already stated, to act as fuel in keeping up the temperature; another portion she selects to add to the flesh, the muscle, skin, and different tissues; and the earths which are held in solution, she carries away by vessels adapted for that purpose, and deposits them atom by atom, until they are so compressed, so strongly compacted together, as to become what we call *solid bone*,—and all this so wonderfully wrought that, as we have seen, small tubes are left in the hard, stony formations both of the bones and of the teeth, that nourishment may be supplied them, holding in solution the material of which they are composed, that the natural waste and decay may be replaced, and injuries repaired.

"It is to this nutrition, and of the earthy matter of which the bones and teeth are composed, a deficiency of which is attended with results so deplorable, that I particularly wish to call attention.

"To what can we attribute the calamity which too often befalls the young? I allude to distorted spines, where the bones composing the spine, instead of forming a column, allowing the body to be erect and dignified, are zigzag in their course, causing one shoulder

to bulge out, and the opposite side to bend or double upon itself. This deformity has been long understood to arise from a deficiency of *lime* in the composition of the bones of the vertebræ, allowing them to fall, press upon, and injure each other, destroying the beauty of the fabric, and the health and comfort of the individual.

"Now let us take a glance at the inhabitants of two countries, natives of which are no strangers on this continent. I take them as examples, because the food of the *common people* of those countries is well known to be of the most common kind. I allude to natives of Scotland and Ireland—the principal food of one being *oatmeal*, and of the other *potatoes*. We have heard a great deal of the famishing poor of those countries, and particularly of the latter,—of the misery and wretchedness seen in every hovel; and there cannot be a doubt that famine walked through the land, when the blight and rot despoiled them of their potato crop, on which, for so long a period, they depended as the great article of food. Now, allowing all this—allowing, in the *best seasons*, the chief article of subsistence has been potatoes for breakfast, dinner, and supper; glad indeed many of them to get a little animal food once a week to dinner, or even far more seldom—I now ask, what number, in the thousands of emigrants from that country who yearly arrive at our ports, are there that show a constitution weak, fragile, and wanting in physical strength? Many, no doubt, arrive, worn down by disease and suffering, and in the last stage of debility; but let them recover from that state, and the robust frame and healthy constitution will be again developed; the bones are strong, the teeth undecayed, and the muscular energy only wanting opportunity to display itself;—in fact, when we wish to denote strength in woman, we use the familiar phrase, 'strong as an Irish woman,' and all this from being reared on *potatoes*.* But then, if we examine the

* According to a memorial presented to the French minister, on the proportions of nutriment of the means of living, by Dr. Glaser, we find potatoes taking no mean rank.

		NUTRITIVE ELEMENTS.	
100 lbs. wheat bread	contains	30 lbs.	
" flesh	"	21 lbs.	
" fresh beans	"	80 lbs.	casein and starch.
" peas	"	83 lbs.	casein and starch.
" lentils	"	94 lbs.	casein and starch.
" potatoes	"	25 lbs., albumen, starch, and sugar.	
" carrots	"	14 lbs.	albumen with sugar.
" beets	"	8 lbs.	albumen with sugar.

analysis of the potatoes, we shall find contained in 100 parts of dry potatoes,—

Carbon	41·1
Hydrogen	5·8
Nitrogen, Oxygen	45·1
Ashes	5·0

"Here we see that potatoes not only contain the nutrient but the earthy constituents.

"But we have a stronger and more healthy race yet, from Scotland and the north of Ireland, who are generally descendants of the Scotch, and continue, in a great measure, the same means in rearing the young. Now, *a* principal, I will not say *the* principal food of the youth of Scotland, high and low, rich and poor, except in the larger cities, among those who class themselves as more refined and more civilized, but who number few in proportion, consists, for breakfast, at least, of oatmeal—that is, porridge and milk; and milk, potatoes, and wheaten, oaten, or pease bread, or *bannocks*, at other times of the day. Animal food among the poor is a rarity; a meat dinner on Sunday *only* being common. Even among the youth of the better class, butcher's meat, or animal food, is by no means a principal article of subsistence. And I would particularly remark that *Scotch oatmeal* (the oatmeal generally used throughout Scotland) is coarse, and contains much of the bran which invests the oat—containing, as it does, a large proportion of the earthy constituents required for the production of bone. Analysis of 100 parts of dried oats gives,—

Carbon	50·7
Hydrogen	6·4
Oxygen	36·7
Nitrogen	2·2
Ashes	4·6

"I may here casually remark, that the advantage to be derived from this wholesome food has not escaped the observation of her Majesty, Queen Victoria, who appears in the multiplicity of her public duties not to lose sight of the equally sacred duties of a mother—and we hear of her son, the heir to the crown of Great Britain, being as fond of his oatmeal porridge as the meanest peasant child in Scotland.

"I rather doubt if parents generally have given to this subject the

attention to which it is entitled. I trust, however, that those who have followed me thus far, may be impressed with its importance. We cannot shut our eyes to the complaint which so generally prevails, of decayed teeth—and a moment's reflection will call to mind the number of the young and beautiful who are prematurely hurried to the tomb, ere yet the bud has expanded into the full-developed flower. Nay, comparing the two countries, the statistics of life and death communicate to us also the important fact, that while the greatest mortality shows itself in England in infancy and childhood, on this side the Atlantic it is found at a more mature age.

"Neither has the tendency of the physical organization of woman on this continent to degenerate, escaped the observation of one of our greatest medical philosophers in this country,* who regards this retrogression as a national calamity, and impresses upon his students the importance of the subject, and the propriety of their attention in attempting to arrest it; and he particularly specifies the great object to be gained in the use of bran-bread made from unbolted flour. On this head I shall have more to say hereafter.

"With these observations, let us now direct our attention to what can be offered in remedy of this evil.

"We have already stated that in no country in the world are children more beautiful or more lovely—healthy in complexion, quick, smart, and intelligent—active, sprightly, and playful in their disposition. Now, in the period from infancy until the child becomes mature—let us, at all events, say until thirteen or fourteen years, and even to a more advanced age—there is a continued growth—a continual deposition of organic and inorganic or earthy particles, which are required for the formation of bone, teeth, flesh, and every part of the human body. I have shown that the essential ingredients for these several formations are all found in the milk of the mother; consequently, as long as the infant is deriving nourishment from the mother, she ought to partake of good wholesome, nourishing food—that the blood, deriving these principles from the food, may be able to supply them in turn to the milk from which it is secreted. So long, then, as the child is thus nourished, so long is it safe, and the rudiment or foundation of a robust frame is laid. And if we are to expect, in future life, the stalwart frame of man, or the enduring, firmly-knit, compact, and healthy physical constitution in woman, the organic and inorganic or earthy com-

* Dr. Jackson, of Philadelphia.

pounds of which that frame is composed must not be denied—nature must be supplied, or nature will fail

"It is not for me to dictate to any parent what shall be the food of his child—it is enough that I point out for their information what may be required to give what in common language is called 'bone and sinew,' to their offspring. It is necessary then that the food of children shall contain:

"1st. Aliment having the *calorifacient* or heat-sustaining principle. And this is contained in quite sufficient quantity in the usual food—in milk, wheaten-bread, potatoes, arrow-root, Indian corn (as mush, hominy, or corn-bread), in most vegetable matter, and in sugar.

"2d. Aliment containing the *nutrient* principle. And this is contained in animal food—the lean of beast, bird, and fish—in milk, eggs, wheat, rye, potatoes, beans, etc.

"And 3d. Aliment containing the inorganic or earthy constituents—on which depends strength of frame, and from which are formed the bones and teeth of the individual. And these are contained in milk, eggs, animal food, and particularly in wheat, rye, oats, potatoes, etc.*

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* On this subject, I extract the following from Carpenter's Physiology, p. 488: "These substances are contained, more or less abundantly, in most articles generally used as food; and where they are deficient, the animal suffers in consequence, if they are not supplied in any other way. Thus, common *salt* exists, in no inconsiderable quantity, in the flesh and fluids of animals, in milk and in eggs; it is not so abundant, however, in plants; and the deficiency is usually supplied to herbivorous animals by some other means. *Phosphorus* exists also in the yolk and white of the egg, and in milk; and it abounds not only in many animal substances used as food, but also (in the state of phosphate of lime or bone-earth) in the seeds of many plants, especially the *grasses*. In smaller quantities, it is found in the ashes of almost every plant. *Sulphur* is derived alike from vegetable and animal substances. It exists in flesh, eggs, and milk; also in the azotized compounds of plants; and (in the form of sulphate of lime) in most of the river and spring-water that we drink. *Iron* is found in the yolk of egg and in milk, as well as in animal flesh; it also exists in small quantities in most vegetable substances used as food by man—such as potatoes, cabbage, peas, cucumbers, mustard, etc. *Lime* is one of the most universally diffused of all mineral bodies; for there are few animal or vegetable substances in which it does not exist. It is most commonly taken in, among the higher animals, combined with phosphoric acid: in this state it exists largely in the seeds of most grasses, and especially in wheat-flour. If it were not for their deficiency of *lime*, some of the leguminous seeds (peas) would be more nutritious than wheaten-flour;

"Of the inorganic constituents contained in wheat (and the same may be said of the other *cereal* grains) I have already alluded to the benefit to be derived from using bread made of unbolted flour. On this subject allow me to refer to the difference of flour having much of the bran remaining, and superfine flour, or that in general use throughout this country, and on which Prof. Johnston has made the following curious but practical observations. Examining wheat and flour, as to the amount of the nutrient or muscular matter, the fat-forming principle, and the bone and saline material, contained in grain in different states, he found—

	Muscular matter.	Fat principle.	Bone and salt.
In 1000 lbs. of whole grain.....	156 lbs.	25 lbs.	170 lbs.
" " fine flour.....	130 "	20 "	60 "
" " bran.....	.....	60 "	700 "

"Taking the three substances together, according to Prof. Johnston, of a thousand pounds, the three substances contain of the ingredients mentioned,—

	Whole grain.	Fine flour.
Of muscular matter.....	156 lbs.	130 lbs.
Of bone material.....	170 "	60 "
Of fat.....	28 "	20 "
	354 lbs.	210 lbs.

"Accordingly, the whole grain is one-half more nutritious than fine flour.* It also shows the very great proportion of *bone material*—that is, *earthy constituents*—contained in the bran; no less than 700 out of a thousand parts, or a *little more than two-thirds* of the whole. Now, by reference to the same work, we find, in a communication from a Mr. Bentz, the difference in weight of a barrel of flour without the bran, and when only the outer coating of the wheat is taken of. He says, 'The weight of the bran or outer coating would, therefore, in the common superfine flour, constitute the *offal*, weighing only $5\frac{1}{4}$ lbs. to the barrel of flour, while the ordinary weight of offal is from 65 to 70 lbs. to each barrel of flour; showing a gain of from $59\frac{3}{4}$ to 65 lbs. of wheat in every barrel of flour.' Now if we estimate the earthy constituents to be two-thirds of the offal or bran, we must consider that there is an actual loss of these im-

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the proportion of azotized matter they contain being greater. A considerable quantity of lime exists, in the state of carbonate and sulphate, in all hard water."

* Patent Office Report, 1847, p. 116.

portant constituents, which might be reserved, in every barrel of flour, of 40 lbs.

"*Again*, if we estimate (according to the average of the consumption of flour to the amount of population, as one barrel to each individual) that every child shall consume aunually only half a barrel of flour, then we find that by the use of the superfine flour, as commonly used in families, the child is deprived yearly of twenty lbs. of those earthy substances which are required to form the bones and the teeth. When we speak of a child consuming half a barrel of flour annually, it appears a large quantity; but when we reduce the same to a daily allowance, we find that it is little more than 4 oz. or $4\frac{1}{3}$ oz.; and every parent must know that this would be a very small amount to limit children. Yet we see how large a quantity of the bony material would be added if unbolted flour was used instead of the present superfine flour. I may here add, that the oatmeal used in Scotland, already referred to, contains the bran or inorganic constituents, while the oatmeal used in England is deprived of it. Now this is a great loss of the most valuable constituents in only one of the principal articles of the food of children; and if we allude to another article, which is largely used on this continent,—I mean Indian corn (and I may also add the fat of meat, both of which, children, if allowed, will partake of very freely),—we shall find that both of these abound more in the calorifacient or heat-sustaining principle, and for the deposition of fat, than the nutrient, and that they are quite deficient of the earthy material *of lime*—that material on which so much depends the proper structure of the teeth. Analysis of Indian corn shows the following composition—as taken from Mr. Salisbury's prize essay—read at the New York Agricultural Society for 1849:

Whole kernel.

Starch	50·64
Sugar and extractive	7·46
Sugar	1·50
Fiber	6·28
Matter separated from fiber	0·05
Albumen	8·64
Casein	1·70
Gluten	4·56
Oil	4·00
Dextrine or gum	4·84
Water	10·22
	99·89

Ash of the kernel constituting about two per cent.

Carbonic acid	a trace.
Silicic "	1·450
Sulphuric "	0·206
Phosphoric acid	50·955
Phosphate of iron	4·355
Lime	0·150
Magnesia	16·530
Potash	8·286
Soda	10·908
Chloride of soda	0·249
Organic acid	3·400
	97·000

"This is a most elaborate analysis—far more minute than any analysis we have had of any of the articles of food—in fact, more minute than satisfactory; for the analysis of the whole kernel does not exhibit any amount of inorganic constituent; and when the whole was converted into ashes, we find that the *lime* only amounts to *the one-sixth of one part* in a hundred. Now, on inquiry, I find, on the authority of a very intelligent miller of this city, that in grinding corn, the bran or thin skin of the grain is detained in forming it into corn-meal; consequently, it is deprived of even that portion more particularly containing the earthy constituents. This gentleman, in conversation, mentioned an important fact relative to this deficiency of lime in corn. To the best of my recollection, he observed, 'This stands to reason; for, ten years ago, all the lower part of Jersey grew excellent corn, but would not grow wheat; but since the introduction of *lime* as a manure they have raised considerable wheat crops.' Now the fact is, it is not the habit or food of this plant, even had *lime* been in the earth; and magnesia and the saline manures are recommended to the agriculturist as best suited for its proper development.

"It is generally looked upon as invidious, and one is more likely to incur odium than to receive credit for saying one word against a food which stands so high in public estimation, and is so universally used over this continent. Yet it must not, for one moment, be supposed that I condemn the use of Indian corn in its various forms of mush, hominy, bread, or pudding as an article of diet; far from it. But containing, as it does, a large proportion of starch and fatty matter, rather a small proportion of the nutrient principle, and quite a deficiency of the inorganic or earthy constituents, I consider it as valuable, as a light diet, for heat-sustaining purposes only, and

therefore a desirable adjunct *to other food*, containing more nutriment and a due proportion of the earthy constituents.

"As an example or illustration of the want of the nutrient principle in corn or corn-meal, I may here allude to the effects I have seen in the West Indies, where, in a dearth of the ordinary provisions on which prisoners were fed, corn-meal was substituted; corn-meal and salted herrings, fish, etc. constituting their food. Now the effect was, that all the prisoners lost their natural strength; at the same time they became fat and bloated, inclining to dropsy: and this was not the effect of incarceration; for the prisoners were engaged in road-making, trimming fences, etc., consequently, in a healthy and exhilarating employment.

"In reference to our domesticated animals, it may be asked, Why is corn so useful, as an article of food, to animals generally—horses, hogs, sheep, etc.? I have already shown that the overplus of the calorifacient food, after what may be required for sustaining the temperature, is stored away in the form of fat. Now, if we instance the horse, corn is generally, if not always, given as an adjunct to his more usual food, hay. And we find by analysis that grass or hay contains not only the nutrient principle, but the inorganic constituents required in the formation of bone, etc.

"One hundred parts of dry hay contain—

Carbon	45·8
Hydrogen	5·0
Oxygen	38·7
Nitrogen*	1·5
Ashes†	9·0
	100·

"Thus, the hay gives to the animal strength in bone and muscle, while the corn supplies additional heat-sustaining properties, and lays by, in the form of fat, the overplus as a reserve. The harder the horse is worked, the more corn he can bear; the great proportion of the carbon being carried off by the lungs, and the hydrogen and oxygen, as water, in exhalation and perspiration. But if the same quantity is given to a horse at rest, it overloads him with fat, which, in his case, accumulates more internally, or around the internal organs, and will, in course of time, induce disease; while in

* Fifteen pounds of such hay, containing oz. 3·095 of nitrogen.

† These ashes having a good proportion of lime.

the pig, under similar circumstances, the fat is laid on externally, if I may so speak, giving the rich fat pork of our markets. And here I would again remark, that no farmer would consider it necessary or essential to give corn to a young colt or horse, until required to work; nay, so careful is nature, in appropriating just so much and no more of any constituent that may be required, that the food of the young horse should be more nutritious than heat-sustaining, and that there shall be no superfluity to store away fat, we find by analysis that the milk of the mare has little or no butter, in fact only traces of it, in its composition.* What a lesson in the animal economy is here given, and what a practical illustration of the requirements of the young of that and other animals!

"Again, it may be contended that among the beautiful children we see on every hand, there is no want of those who are fat and hearty. It is not *fat* we want—it is bone and muscle—with so much fat only as shall give firmness to the flesh and plumpness to the figure. Fat, although it enters intimately into union with the other component parts of bone and muscle, cannot be transformed either into the inorganic constituents of bone or teeth, or into muscular fiber; these must be contained in the food consumed, in the first place, and thence transferred to the blood.

"How necessary, then, how important it is, if we expect to give strength and vigor to the consitution, that the food, in the first years of infancy and childhood, when the formative process is going on, should receive some further attention than has hitherto been given to it; and if our youth,—if our young females have hitherto been deprived of the necessary constituents for the full development of every portion of the body,—can we wonder that a woman should be the delicate and fragile being she is, or that by the decay which assails the teeth in early life, she should be deprived of an ornament of so much value? If this state of things can be altered,—if the physical constitution of woman in America can be saved from further degeneracy,—a purpose may be effected, of consequence even in a national point of view; for it is to the healthy and vigor-

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* Analysis of mare's milk.

Water	896·3
Butter	traces.
Casein	16·2
Sugar of milk, extractive matters, and fixed salts	87·5
	1000·

ous constitution of woman that we must look for a race of hardy, vigorous, and enterprising freemen.

"In conclusion, I would briefly state that this is a matter in which professional aid can avail little; it lies at the door, and must be the work of parents generally. It is for them to understand the great value to be attached to the food on which their children subsist—that it shall be wholesome and nutritious, and abounding in the earthy compounds so absolutely necessary to their proper development. If the chief articles of food have hitherto consisted of compounds made of superfine flour, corn-meal, and the fat of meat, let there be substituted in their stead, bran-bread, milk, eggs, the lean of meat, and potatoes; let more attention be given to the nutrient quality of the food; let there be no deficiency of those articles containing the earthy material, that the bones and teeth shall not be deficient in those constituents so necessary in their composition and structure; and I should be inclined to hope that the evils which now exist will be lessened, and the physical organization of succeeding generations be equal to that of any nation upon earth."

We pass here from the consideration of primary impressions to the treatment of caries, as met with in the growing child or adult. And, first, we may spend a few moments in considering the direct local attention demanded, and from which our investigations should carry us to other constitutional relations than the primary impressions just considered.

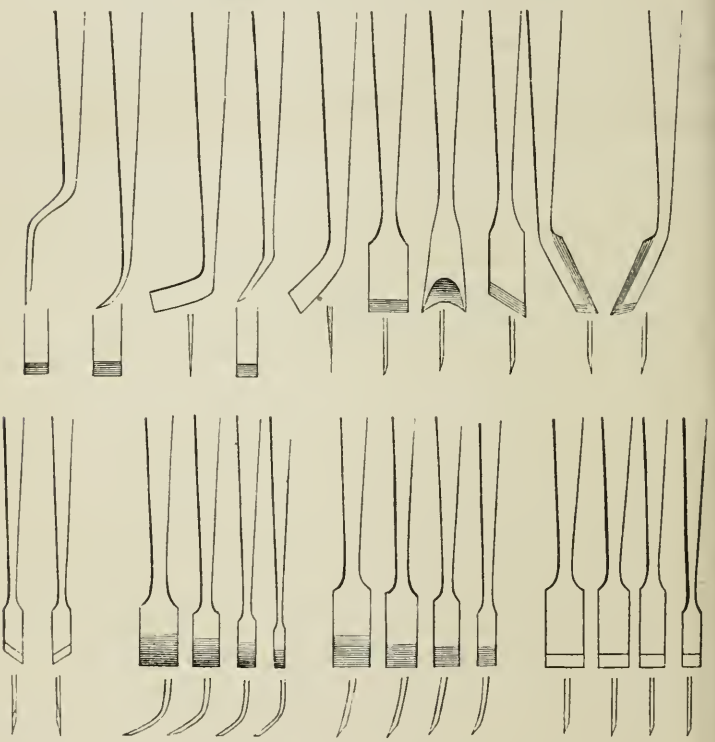
Caries of a tooth differs from caries of common bone only in the fact of an inability to repair by any secondary material the injury done through the destructive influences of the disease,—requiring for the restoration of harmony to the parts, and for the protection of the exposed susceptible dentine, a mechanical treatment. The operation demanded, being one of everyday performance, and withal one urging man to the attainment of skill, through the pecuniary reward its successful accomplishment offers, has given to this department of operative surgery a degree of skill and perfection attained by few others; and yet, is this class of operations embraced within a few such simple principles, that any practitioner, with an ordinary amount of ingenuity, has only to practice to become skillful.

The local treatment of carious teeth consists in cutting from the cavity of decay all dead and dying matter, and after well cleansing and disinfecting the part, replacing that removed, with some unirritating and indestructible material.

The first step in the operation consists in getting at the disease. This in many cases is quite easy enough, the cavity lying so exposed that it is only necessary to have the patient open the mouth to see it. In other instances, and these much the most numerous, the decay lies in such position that much cutting and filing, and it may be wedging, are necessary to the exposure. This matter, to be properly appreciated, must be studied in connection with the individual cavities.

Teeth are filled or stopped with various materials,—gold, tin foil, amalgam, and tooth-bone being the principal agents employed.

Fig. 34.—Forms of Chisels used in Dentistry.



Of these, by far the best is gold, and after this the tin; the two latter agents being not at all reliable, and only perhaps allowable where, from the extent and character of the decay, a tooth must be filled with a plastic material or otherwise sacrificed. It is as easy

to fill a tooth with amalgam or with tooth-bone as it would be to fill it with putty.

The instruments employed for filling teeth are very numerous and varied, each operator possessing certain favorite styles; but the instruments absolutely necessary to the performance of the operation are really — as in all other operations — very few and very simple.

In the first place, it being necessary to expose the cavity, chisels and files are required. Chisels are made straight, curved, and at right angles. An accurate idea of what they are may be derived by an examination of the drawing.

Files.—Files are of every conceivable form.

Fig. 35.—File, with Carrier.

Fig. 35 represents a carrier having in it a straight file, such as is used for the separation of the first six anterior teeth. A modification of such a straight file, much used, is one with a curved and convex face. Files, cut on long shanks, with a curve to clear the lips, are used for the back teeth; these are made rights and lefts. The straight file is seldom used in a carrier, the fingers being found the more convenient means.

A cavity exposed, its excavation or cleansing is the next step; for the accomplishment of this operation instruments called excavators are necessary. These, like the chisels and files, are various in pattern; yet, whatever the peculiarity, they are only modifications of two elementary styles, which two styles are used principally by every dentist, and are known as the hoe and hatchet excavators, the one cutting, when pulled toward the operator, hoe-like; the second represented by the cutting edge of the ordinary hatchet.

Drills.—The rose drill is a favorite instrument with the dentist. These are of various sizes, and when sharp, will cut out a cavity on the grinding face of a tooth very perfectly and very rapidly.

The spear-shape, a modification of the rose, is much used.

A tooth, to be properly excavated, must not only have every particle of diseased matter removed, but the cavity must be made of such form that it will retain the material to be impacted, and not

Fig. 36.—Hoe Excavators and Modifications.

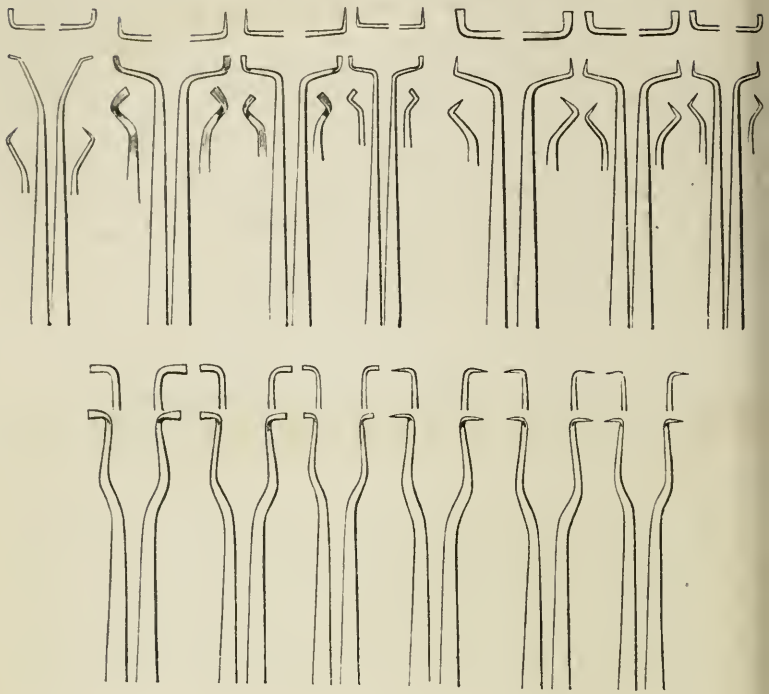


Fig. 37.—Hatchet Excavators and Modifications.

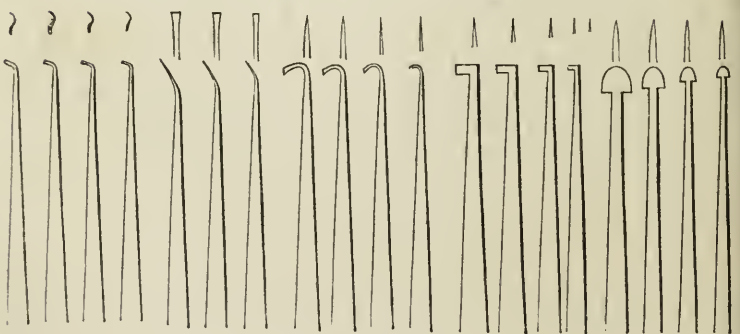
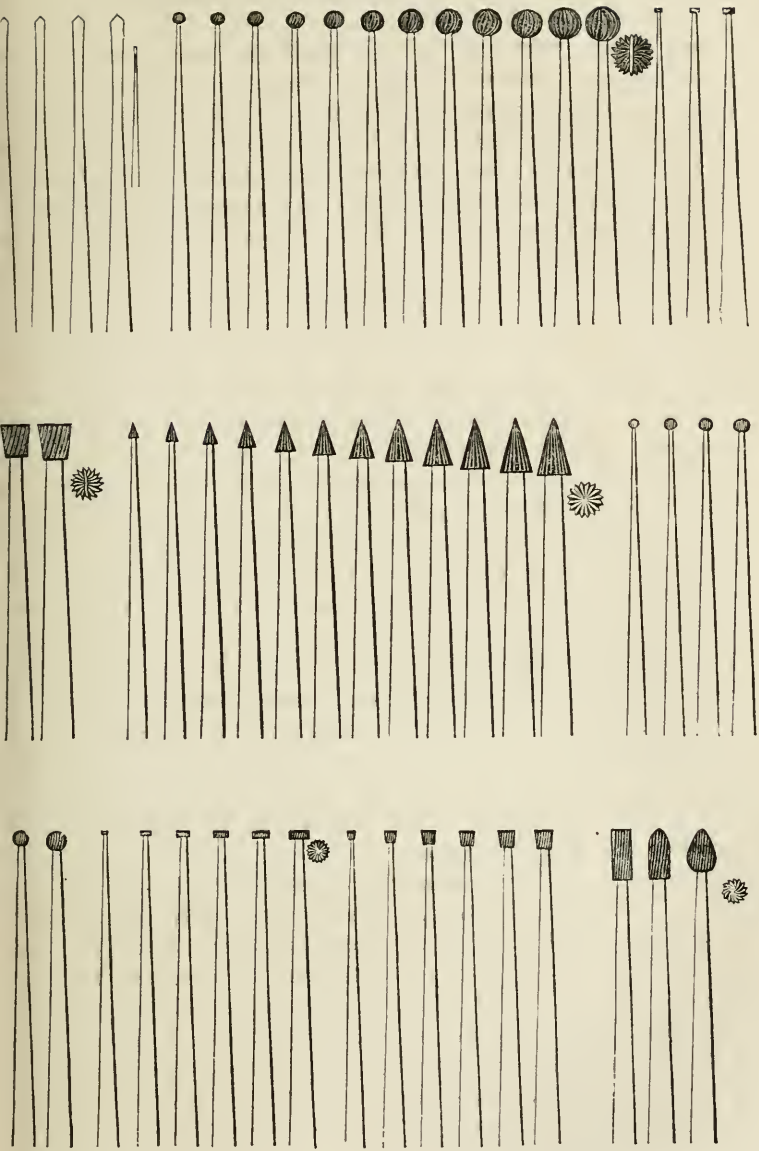


FIG. 38.—ROSE DRILLS AND SPEAR DRILLS.



only this, but it must retain it, while being of a shape that every portion of the walls can be gotten at with equal facility. In other words, the cavity should not be larger than its inlet or margin; should it be so shaped, and should the material employed to fill it be either of the foils, such filling is most apt to be imperfect. Irregular or ragged edges are not to be allowed. Good joints, or union between the metal and teeth, cannot possibly be effected under such circumstances; hence, an operation, otherwise good, becomes of little avail. Also, it is important that no sulci or sharp angles should exist within the cavity, but every part, if possible, is to be rounded and regular.

FILLING.

Gold, the best material to be employed, is used in two different forms; prepared either as a leaf or as a spongy mass.

Gold Foil or Leaf Gold.—The manufacture of leaf gold, or foil, must be an exceedingly nice manipulation, seeing that so many have undertaken it, and yet so few have succeeded in satisfying the dentist. Some gold foil is exceedingly adhesive, so much so indeed that with serrated instruments it can readily enough be stuck piece to piece, or welded. In this form it is now most commonly used, and may be quite as easily attached and built upon the plane surface of a metal dollar as within the cavity of a tooth. To effect such result, it is only necessary to keep the parts and metal perfectly dry, and to use instruments with sharply-serrated points. A fault, however, not unfrequently attached to this adhesive gold, is its want of softness or ductility. Unadhesive gold foil, employed entirely by some operators, is made to support itself within a cavity by a process of wedging; in this form it is used, either rolled up as cylinder, or otherwise as pellets.

Gold foil comes into the market done up in books—these books being numbered from 4 to 35. The number signifying the weight by grains of each leaf. Of these different numbers, some prefer one, some another; it is perhaps a matter of choice rather than difference.

Sponge Gold.—This preparation, as implied in its name, comes in the form of a sponge or porous mass. It is most adhesive, and if kept perfectly dry during the process of manipulation, can be attached particle to particle, until a tooth, however broken and imperfect, can have its outlines perfectly restored. To use it, instruments, as employed with foil, sharply serrated, are necessary; and the

portion of the mass to be employed is to be separated or picked into small pieces by the employment of instruments rather than the moist fingers. A large piece, or a bulk of size sufficient to retain its place in a cavity, is to be first introduced and worked into a solid mass; to this first piece particle after particle is to be attached until the cavity is filled. It is a much more tedious preparation to work than the foil, and, for a perfect operation, demands much more skill, and infinitely more patience.

Gold, as a preparation for filling teeth, while the most perfect article employed, is yet not without its objections. It is, unhappily for this purpose, an admirable conductor of thermal changes, and when used in close proximity to the pulp of a tooth, not unfrequently so irritates it as to result in its inflammation and death. Another objection is its color.

Tin Foil.—This is simply purified tin beaten into thin leaves. It is worked precisely as gold foil, and answers, to an extent, the same purpose. It is a softer metal, and less capable therefore of resisting the wear and tear of mastication. It is still more objectionable in color than gold, but possesses an advantage over it in being a less sensitive thermal medium. It is also comparatively inexpensive.

Amalgam.—This is a preparation of silver and tin amalgamated with mercury. It is made by melting together varying proportions of the two first named metals, say equal parts, or four parts of silver to six of the tin—different persons having different formulæ—and, when thus united, is comminuted by the file, and put aside for use when needed.

To make an amalgam, or paste filling, as it is as frequently called, take a portion of these filings, enough to correspond with the size of the cavity to be filled, place them in some convenient vessel, add a small quantity of mercury, rub the mass together for a few moments, and the solid grains will be found to have disappeared. Add now to the amalgam a few drops of deliquesced chloride of zinc, and again rub the whole together. As a result, the bottom of the vessel will be covered with a dirty, black pasty mass, while the amalgam, robbed of its impurities, will present itself as a fluid ball of frost-white silver. The next step is to take this ball, and, enveloping it in buckskin, cotton cloth, or linen stuff, press out, with forceps, the excess of mercury; the result is now a semi-solid mass, which is the preparation to be used in the cavity of the tooth. To introduce this material, it is only necessary to thoroughly dry the

cavity with bibulous paper or other absorbing material—supposing the cavity to have been previously prepared—and with any convenient instrument press the paste into place. A few hours, and it will be found to have become as hard as the tooth. It may now be dressed and polished, and the operation is thus completed.

Osteoplastic or Tooth-bone.—This is a preparation of oxide of zinc, silex, titanium, and borax, and is in the market in the form of a whitish, coarse powder. To use it, a small quantity of the material is mixed with a watery solution of the chloride of zinc, and in the form of a paste, thus produced, it is plastered into the cavity. The most perfect dryness is necessary to any success in its use; and, if possible, the filling is to be protected from the fluids of the mouth for a period of several days. This can be accomplished,—first, by protecting and shielding the mass placed in the tooth while in the act of setting or hardening, through the careful employment of napkins and bibulous paper; and, second, by dissolving in chloroform a sufficient quantity of gutta-percha to make a thin paste. This, dropped from the point of an instrument over the filling, will perfectly coat it, and remain adherent for several days, or quite as long as is necessary.

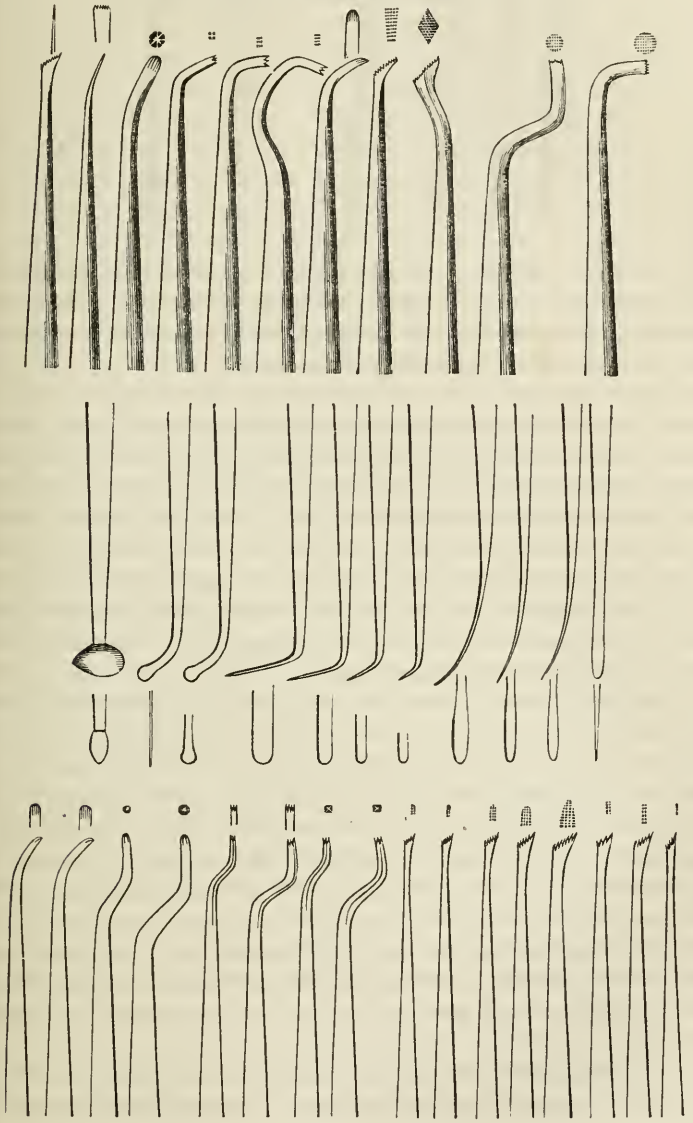
Gutta-percha.—This agent is not unfrequently used as a temporary stopping. It is introduced precisely as the amalgam, being, however, first warmed in the flame of an alcohol-lamp. In its place it is often found quite useful; I have seen these temporary fillings preserve a tooth for years,—it is not well, however, to so trust them. A preparation, much used as a temporary filling, consists of gutta-percha, quicklime, quartz, and feldspar; it is known as Hill's stopping. It can be purchased at any of the depots at a very reasonable price.

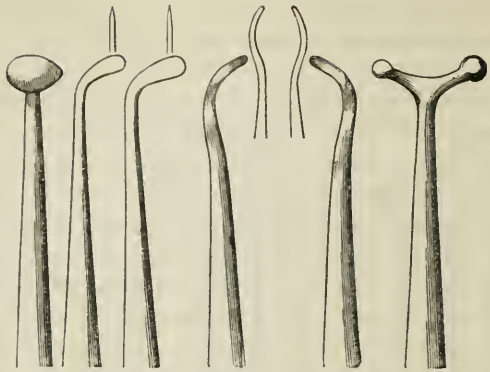
The process of filling a tooth, whatever may be the material employed, is, unless when complications exist, a matter merely of mechanical skill. As before remarked, it requires only practice to become a proficient, that is, taking it for granted the manipulator has mechanical ability. Complications, associated with the system at large, are, however, so frequent in occurrence that it has now become a recognized fact that a general medical education is as necessary for the proper appreciation and understanding of this department of practice as for that of any other. Hence the great progress which all writers are called on to chronicle, and which has in its results been of such great gain to the public at large.

For a continued consideration of this matter, the treating and

filling of individual cavities, the preparation of artificial teeth, etc., the reader is referred to the various text-books on dental surgery.

FIG. 39.—INSTRUMENTS EMPLOYED IN INTRODUCING, CONDENSING, AND POLISHING GOLD AND TIN FILLINGS.





As caries of the teeth is seen to have a strong exciting cause in the influence of local irritants, it naturally occurs that such sources of trouble are to receive a proper degree of attention; hence the employment and use of dentifrices and washes.

In the treatment of any case of dental caries which may present itself, the careful practitioner first endeavors to satisfy himself of the causes, constitutional and local, influencing the diseased condition; of the constitutional causes, all affect the integrity of the teeth which are deteriorative to the system at large. Unhappily for the dental organism, primary unhealthy impressions made upon the teeth, while in their formative or pulpy state, are apt to influence more or less their character for life, just as certain of the exanthemata—variola, for instance—occurring at such period, is so apt to impress permanent pittings upon the enamel.

Unhealthy parents cannot by possibility beget perfectly healthy offspring. Here is a great primary antagonist. The teeth, however, are living, and consequently changing bodies: particularly is this true, physiologically, of young teeth. Constitutional treatment may thus do service even as every molecule of tooth structure is concerned; such treatment would of course be longer in receiving apparent response, as must be evident, when considering the relative low vitality of these organs, than treatment directed to the production of an impression on the soft parts, or on common bone; yet, because a tooth is an organized body, because it has innervation and circulation, such treatment must, to a greater or less extent, be felt.

A first indication calls for the consideration of causes interfering with the proper vitality of any denture coming under observation.

Hereditarily, or how otherwise deteriorated, duty to the patient demands such consideration of the case.

We will suppose a trouble to be hereditary. Here, if we can find in a patient the observable existence or continuance of habits, either of organic functional irregularity, or of animal habits common to the parent, and which is to be esteemed of deteriorating import, our first attention is to be directed to a correction. The parent may have been specifically diseased, let us suppose, by his parent, and thus the bad teeth of both father and child lie in a venereal molecular impression. Here a predisposing cause would have come from and would be still residing in a syphilitic condition. Granting, then, that such molecules, still living, are impressible, would judgment not direct a primary treatment to the production of an impression in such direction? I have treated many a child, for skin and other diseases, where the affliction was an hereditary venereal transmission, and I never thought of directing medication otherwise than in recognition of such a transmission; and satisfied, as every medical man must be, that the circulatory fluid permeates tooth structure, I treat venereally deteriorated teeth on the same common principle, and have found in the result that measure of success which has justified the conclusions. In other words, I have prolonged the life and health of such organs, just as is prolonged the life and health of the patient upon whose molecules are impressed the fiat of the tubercles of phthisis. Such a treatment consists, however, not in administering specific or supposed specific remedies, but in viewing the system as laboring under depressing influences, either of a general or special local signification,—this fact is most important to recognize.

A child may have its molecules deteriorated by a transmitted mercurial impression, or a parent may have been an inebriate, and thus have debased his child in himself. The results of an excessive venery may have been transmitted. A mother, from lack of nourishing material, may have degenerated her offspring. These causes of transmitted ills, the appreciable ones, I may say, are many,—all must recognize them.

Improper diet to the developing child, as we have so fully studied, is plainly enough a cause of bad teeth. The state of health of such a developing child has its influence; indeed, so marked is this that, by an observation of teeth belonging to the various periods of life, one can easily enough trace constitutional variations, for just as at different periods the functions of organic life were healthily or unhealthily performed, so we find the disturbances written in the char-

acter of the teeth belonging to the period. More expressive even than this is the fact that the deciduous teeth mark, in the periods of their solidification, the health of the mother.

That the teeth, in their formative state, partake of the healthy or unhealthy condition of the system at large, all observers now admit. But here, unfortunately, the matter has been left, most practitioners acting on the premises that such impressions are never to be altered. At such a conclusion it is impossible not to express surprise. Who, in his own person or in the persons of friends, has not remarked the varying conditions of the health of the teeth? Up to the age of sixteen I was myself a martyr to toothache; yet, about that period, a change occurred, since which time I have had no trouble. Is it suggested that the teeth may have been filled? That would be very true, but certain of the fillings came out years ago and have never been replaced, yet are the teeth quite as good as those in which the operations remained.

Similar instances exist in profusion, and yet the lesson seems unheeded. There is a constitutional treatment for the carious tooth as there is for the carious maxilla, and from a common stand-point should the diseases of both be viewed. It is not of course every case of a carious bone that demands a constitutional treatment, neither is it so with the teeth; the source of offense in the one, as in the other, may be strictly local in its character; but ill success must ever that practitioner have who has not the inclination to look for a primary lesion outside of things strictly local in signification.

A principal exciting cause of decay in the teeth is found in a lack of cleanliness; most persons, without recognizing it, are careless in their attention to these organs. Another exciting cause lies in injury done by an improper use of them,—the biting of hard substances, as rock-candy, cracking of nuts, etc., breaking in this way the enamel, and thus exposing to irritation the higher organized and susceptible dentine. A lack of proper exercise for the organs is another prolific source of disease; witness the expression of this in the teeth of swill-fed cows. Children and adults should use, in part at least, food which requires mastication for its comminution. The lodgment of decomposing particles in the sulci, and between the teeth, should be strictly guarded against. To this end the quill or pick of wood or brush should be frequently and freely employed. Certain irritative conditions of the oral fluids should receive attention; thus, whether this fluid be too acid or too alkaline, it is alike

injurious, and should receive correction. A piece of common litmus paper is always at command for these analyses, and the conditions of the fluid can be ascertained at any time in a single moment.

An inspissated mucus is another source of offense to the teeth. In some mouths this is so persistent and offensive in character as plainly enough to point to its constitutional origin. To correct it I have always placed most reliance on the exhibition of the mineral acids, assisted by a free course of salt bathing. As a local antagonist there is nothing better than an astringent acidulated wash, conjoined with the permanganate of potass.

A very good formula is as follows:

R.—Decoct. quercus (fort), ℥vi;
Acid. sulph. aromat. ℥i;
Potass. permang. gr. xx. M.

This may be used in full strength, or it may be diluted, pro re nata. Conjoined with this treatment, the aqua chlorinat. of Watson may be used; fifteen drops given once a day for a few days will correct all disagreeable odor, and render the breath sweet and pleasant.

In an acid condition of the oral fluids, where local medication seems necessary, a very pleasant formula is as follows:

R.—Tinct. capsici, ℥ij;
Tinct. pyrethri, ℥i;
Tinct. cinchonæ,
Tinct. quillai, āā ℥ij;
Aqua calcis, ℥iv;
Ol. gaultheriæ, q. s. M.

This may be used on the brush as an ordinary wash, and will be found quite agreeable.

An alkaline local indication may very well be met by a prescription like the following:

R.—Tinct. capsici comp. ℥i;
Acid. sulph. aromat.
Aquæ cologn. āā ℥ij;
Spts. vin. Gal. ℥iij;
Tinct. quillai, ℥ij;
Ol. lim. vel verbena vel gaultheriæ, q s. M.
Sig. Use pure or dilute, as most agreeable.

Tooth powders are necessary to proper cleanliness. A very good combination for everyday use may be prepared as follows:

℞.—Os sepiæ pulv. ℥i;
Carbo ligni pulv. ℥i;
Coral pulv. ℥ss;
Lap. pumic. pulv.
Cretæ prep. āā ℥i;
Iridis flor. pulv. ℥i;
Ol. limon. q. s. M.

The objection to such a combination, that certain of its ingredients are insoluble in the fluids of the mouth, does not, in my observation, hold good. It will keep the teeth very clean, and, like all powders, should have the frequency of its use modified by the end to be accomplished. Of course, like all other good things, it could easily enough be abused.

Castile soap is an excellent article for occasional use. Its too continuous employment, however, is apt to induce a spongy, relaxed condition in the gums.

Floss silk, well waxed, should be used daily between the teeth, or where there is much tendency to the collection and retention of particles, it may be employed unwaxed, and being wet, enveloped in pumice or cuttle-fish powder. Thus prepared, it can be made to keep the approximal surface very clean. Common lamp-wick is even a better material than silk, if the spaces are open enough to permit its use; it is not nearly so apt to irritate the gums.

Caries of a tooth has, as its sequelæ, sensibility of the irritated and inflamed dentine; exposure of the dental pulp, accompanied by the pains of irritation and inflammation; periodontitis not unfrequently; reflex neuralgic pains; and, in occasional instances, epulofungoid excrescences from the exposed pulp.

The prophylaxis to these conditions consists in checking and controlling the caries on its earliest appearance.

CHAPTER X.

DISEASES OF THE TEETH.

ODONTALGIA.

Under this common head we shall consider all the various pains in the teeth, however induced. The term comes from the two Greek roots, *odous*, a tooth, and *algos*, pain—odontalgia, toothache, or pain in a tooth.

The causes of toothache may be classed under the following heads:

1. Sensitive dentine.
2. Direct or indirect exposure of the pulp to sources of irritation.
3. A diseased state of the periodonteum.
4. Confinement of pus and gas in the pulp cavity.
5. Granules of osteo-dentine in the pulp.
6. Sympathy.
7. Recession and absorption of the gum and alveolus.

1st. *Sensitive Dentine.*—Some teeth, immediately upon the breaking down of the enamel and the consequent exposure of the dentine, become exceeding sensitive, or, in other words, exhibit themselves as peculiarly susceptible to the influence of irritating agents. This impressibility is caused in some instances by the exposure of the enamel membrane, in others by an excess in the organic elements of the tooth; from the endosteum, and perhaps periosteum, nerve filaments permeate more or less completely all the intertubular spaces of such teeth, and thus in proportion to the surface presented is the existing irritability. The pain, under these circumstances, is seldom, perhaps never, unless the irritation is carried to the pulp, at all acute, but rather dull and annoying, and influenced almost wholly by the contact of irritating substances. Thus sweets, taken into the mouth, or cold or hot drinks, or acids, will at once create pain. Sometimes the discomfort arising from sensitive dentine is continuous. In these cases the cause must be looked for in some irrita-

tive condition existing in the oral fluids. These may be too acid, or otherwise too alkaline. Test with the litmus, and prescribe accordingly.

Medicinal obtunders are by some highly recommended as direct applications to teeth thus sensitive, but their employment must always be made with much caution. Cobalt, arsenious acid, chloride of zinc, chromic acid, acid nitrate of mercury, are preparations employed. The danger arising from their use is the too common ill effect upon the dental pulp, this organ being very apt to be irritated and inflamed by absorption of the obtunding agent. My own impression is that such agents as are escharotic in their qualities should seldom, if ever, be employed. In place, it is much better to apply chloroform, aconite, or preparations of kindred character. Better still, avoid the use of the irritating agent; or, if this is not practicable, antagonize its irritative quality through an adapted prescription.

A permanent cure for sensitive dentine is to be found in plugging the cavity, and this is, without doubt, the proper treatment. Burnishing down the tubules is another remedy proposed; this frequently answers, temporarily, a very good purpose.

The excavation of a sensitive cavity is sometimes most unbearable. It is better, however, that the patient should endure the suffering than risk destroying the vitality of the tooth; or, if such endurance is impossible, it is better that he should be etherized. A very few cuts of a sharp excavator will generally be sufficient to clear out the débris, and if the instrument is used with boldness and skill, the pain is very quickly over. Etherization needs not, of course, be carried to any very profound extent.

To distinguish between the common sensibility of exposed dentinal structure and sensibility arising from exposure of the dental pulp, it is only necessary to use an instrument in examination of the cavity. If the trouble pertains alone to the dentine, all parts touched will be found alike sensitive. If the nerve or pulp is exposed, the pain to touch increases as the instrument approaches the deepest part of the cavity, or the seat of the exposure, such seat being not unfrequently in cornua, which may run quite near to the surface.

2d. *Direct or Indirect Exposure of the Pulp to Sources of Irritation.*—Reference to the anatomy and relations of the dental pulp, exhibits it as a body composed of the most delicate connective tissue, in which ramify nerves, arteries, and veins. This body is lodged

in a bony cavity, sufficient only in size for its comfortable accommodation, and for the halitus or fluid which surrounds it. Any undue congestion will therefore at once be perceived to result in a pressure, and which, from the presence of nerve matter, must yield acute pain. This appreciated, the pains resulting from an irritated pulp must be felt to be alike in general character.

A pulp need not, as suggested in connection with applications employed to obtund sensitive dentine, of necessity, be fairly exposed to be the subject of irritation.

Cases not unfrequently occur where the plate or floor of a cavity is so thin and so altered in structure that it will yield or bend. In these instances the agencies of mastication may and do readily enough force this plate down upon the pulp. As a consequence of such pressure we have irritation, and, it may be, inflammation.

Irritation of a pulp is much more apt, however, to be associated with its exposure. Here everything entering into the cavity is a source of offense, and the lesion is always plainly enough discoverable; foreign particles coming in contact with such an exposed pulp give instant and perhaps excessive pain. This pain may quickly subside, or it may continue for hours or days; in the latter case, inflammation will be found to have established itself.

A free and open break into the pulp cavity is attended with much less pain in inflammation of the organ than more limited exposure. In the first case, the swelling pulp has plenty of room, and consequently less pressure is exerted on the nerve filaments. In the second, the protruding congested organ becomes quickly strangulated, and thus pain of the most acute and severe character is induced.

The treatment of an exposed pulp is of a twofold character,—palliative and radical. The first consists in the employment of soothing and quieting applications, and is principally employed for the relief of children. The second implies the destruction of the pulp; this being generally effected through the instrumentality of escharotic applications. To quiet an irritated pulp, a first attention is to be directed to the removal of any and all sources of offense. If the fluids of the mouth are irritative, the character of the condition must be sought for and corrected. If foreign particles have found their way into the cavity of decay, they are to be carefully syringed away with warm water. Such attention may be all that is sufficient. If not, and the excitability continues, recourse should be had to soothing applications,—chloroform, aconite, and laudanum, in equal parts,

sometimes act very happily, particularly in such cases as depend upon excitation unattended with inflammation. Where evidence of congestion or vascular excitement of any grade exist, lead-water and laudanum will frequently act like magic. Persulphate of iron and tinct. iodine, in similar conditions, are found sometimes to act very happily, constringing the vessels, and thus breaking up, or aborting, as it were, the congestion. In the odontalgia of first dentition, it is well that the parent should be provided with a general prescription. A very good one is as follows, to be applied by saturating a small piece of cotton and laying it loosely in the cavity:

R.—Creasotum, gtt. vi;
Tinct. iodinii, ʒi;
Aqua plumbi, ʒss;
Chloroform,
Tinct. opii, āā ʒi. M.

Such a prescription is suggested on the principle of Dewees' carminative, and meets, in some one or another of its ingredients, the single or various indications that may be present.

In a severe inflammation of the pulp, it may be necessary to resort to more indirect medication: blisters upon the nape of the neck will frequently result in speedy relief; hot pediluvia; saline cathartic medicines, as the sulphate of magnesia; diaphoretics, as the spirits of Mindererus; or diuretics, as the niter preparations. An inflammation of the dental pulp, if not too far advanced, may almost invariably be broken up by the administration of from ten to forty grains of bromide of potassium, the application of a mustard poultice to the back of the neck, and a hot foot bath, continued from twenty minutes to half an hour.

To destroy a pulp, a small portion of the following may be laid in the cavity, and loosely covered with wax, or cotton saturated in sandarac varnish:

R.—Acid. arsenicum,
Morph. acet. vel morph. sulph. āā grs. x;
Creasotum, q. s. for a thick paste. M.

Of this a piece the size of a common pin-head will be found quite enough for the purpose. In the application of this arsenical paste, means should be taken to insure its action as speedily and thoroughly as possible. If too little is used, it produces not the death of the pulp, but an inflammatory action, which is apt to involve

the whole tooth, making it tender and irritable, resulting, not unlikely, in chronic periosteal trouble. To insure a speedy action, it is well to somewhat freely expose the pulp before making the application. A very admirable plan, if convenience permits, is to prick the paste into the organ with a needle-pointed instrument; a pulp so treated in my own mouth was thus rendered capable of a painless removal after a very few minutes, and without the slightest apparent inflammatory action being provoked.

Arsenic applied to a pulp for its destruction had better be removed after twelve or fifteen hours. I do not recognize this, however, as absolutely necessary, particularly in the fully developed adult tooth; but such practice is not at all amiss, as thus the possibility of its effects on parts beyond the foramen is guarded against.

In referring to the physiological changes constantly in progress in young teeth, and particularly the deciduous set, the inadvisability of arsenic as an application is at once made evident. Here the foramina are in various conditions of enlargement; and applications of such character would of course pass at once through these to the parts beyond. If the destruction of the pulp in this class of teeth becomes a necessity, the object may be effected by the continuous and daily employment of creasote, to which has been added equal measure of Monsel's solution of the perchloride of iron.

A permanent tooth, after the destruction of its pulp, can have the cavity filled, and be made, in the majority of instances perhaps, quite as useful as ever. (See works on Dental Surgery.)

A cause of odontalgia from an irritated pulp frequently exists in the case of plugged teeth, from proximity to the organ of the material used in the filling. In these instances a constant irritation is kept up by thermal impression, induced by the presence of the metal. If inflammation supervenes, the pain, because of the perfectly inclosed condition of the pulp, becomes of the most acute and unbearable character; relief will generally be obtained by the removal of the filling; or, if this should not succeed, the pulp may be treated as above described. Where several teeth are in a state of irritation from such a cause, and confusion of distinct location is thereby induced, as is not unfrequently witnessed, the affected teeth can be made clearly to designate themselves by holding in the mouth cold water; or, what is even better, touch each particular filling with some steel instrument. The increase in sensation will be thus made very marked.

The dental operator frequently cures such teeth by introducing

between the filling and floor of the cavity some non-conducting substance,—a piece of ordinary quill, a particle of asbestos, a layer of gutta-percha, or a portion of the Hill stopping.

Still another source of irritation to the dental pulp is found in the wearing down of the teeth. This is particularly observed in persons who use large quantities of tobacco, or in such as have the upper and lower teeth directly articulating. Happily, however, in the generality of such cases, nature antagonizes the external influence by depositing, in quantities as needed, secondary or osteo-dentine within the pulp cavity, contracting at the same time this organ, so that, in proportion as the tooth wears away on its cutting face, the pulp recedes, and casts out, as its protection, this secondary material. It is a beautiful and wonderful process of offense and defense, and commands our admiration.

In some cases, however, and these not a few, this reparative or protective power does not seem to exist; where this happens, the pulp becomes, of course, soon the subject of irritation. I have seen, from such a cause, some of the severest cases of odontalgia. The only cure is to be found in the destruction of the pulp. To apply arsenical paste under such circumstances, there being no cavity of decay, it may be sufficient to lay it in the cup-shaped depression commonly existing on the cutting faces of such teeth (the result of the more rapid wearing of the inner dental structure over the outer enamel wall), keeping it in place with a covering of wax. When possible, however, it is much better, and more speedy practice, to carefully drill an opening into the pulp cavity, and with a delicate needle pick the arsenic directly into the pulp. The death of the organ secured, it is to be removed from its cavity by a barb, and its place supplied with gold.

Improper union of metals in the filling of a tooth is another not unfrequent source of irritation to the dental pulp. Tin foil is sometimes placed in the bottom of a cavity, and the operation finished with gold. In many, not in all instances, this composition produces a galvanic action, which, if not removed, will quickly enough destroy the pulp.

Still another source of irritation is the employment, in cavities more or less in proximity to the pulp, of the preparation described as tooth-bone: the chloride of zinc used in the compound will not unfrequently, within a very few hours after its application, produce an inflammation in the parts almost, if not entirely, uncontrollable; few preparations require to be used with more judgment.

A tooth so irritated is to have the filling removed, and perhaps it will always be found the best practice to finish the death of the pulp as speedily as possible. As a reverse to this, it is undeniable that the use of this material will sometimes prove just provocative of sufficient irritation to excite the secretion of secondary dentine, thus proving the best practice that could have been pursued.

A pulp may give every evidence of being in an irritated condition where the osseous integrity of the tooth is perfect, or seemingly so. Here the cause may be still strictly local, or it may be constitutional. Blows received by a tooth often result in such irritation. Atmospheric changes will sometimes account for the condition. Pieces of ice brought and retained in contact with teeth of loose structure are frequent sources of such trouble. Cracks in the enamel, induced from whatever cause, and permitting the impression upon the dentine of external influences, are other explanations. In a constitutional direction, rheumatism is, perhaps, the most frequent source; after this, gout. Reflex or radiated irritability is a frequent manifestation. This is, perhaps, most observable in the hysterical female. In these cases no special rules are required. It is only necessary to discover the cause of offense, wherever and however situated, and to remove it if possible. In the odontalgia of gout, dependence must be placed upon the exhibition of colchicum; twenty drops, three or four times a day, according to the urgency of the symptoms, may be given. In rheumatism, I know few better combinations than the following. Its administration to be preceded by a free purging with a saline cathartic.

R.—Ext. belladonna, grs. vi;
Vin colch. rad. ℥ss;
Tinct. guaiac. ammoniat. ℥vi;
Potass. iod. ℥ss;
Aqua cinnamomi, ℥vi. M.

Sig. To the adult give a tablespoonful three times a day in a little water; if it act too freely on the bowels, add opium q. s.

Functional derangements of the stomach might perhaps deserve special attention, as the reflex or radiated odontalgia is concerned. Any one who has ever observed the relationship existing between the pneumogastric and third nerve, as manifesting functional stomachic derangement in the enlargement of the pupil of the eye, will be at no loss to associate the fifth and ninth nerve. Pure neuralgia, as the term has common signification, is, I am satisfied, a

very rare affection; an aching nerve will generally be found to have some lesion outside of a so-esteemed idiopathic condition, and the lesion can generally be discovered by closely looking after it.

3d. *A Diseased State of the Periodonteum.*—To the existence of this condition I have before had occasion to allude. Its most common and precedent lesion is inflammation of the pulp. When this inflammation extends through the foramen of the tooth, it involves, by continuity of relationship, the enveloping membrane. As a first indication of such extension of the trouble, a slight soreness on the occlusion of the teeth is felt, or when the affected one is struck. A few hours later and this soreness has increased to a marked extent. The tooth is now elongated in its socket, or thrust outward, the result of the congestion. So decided is this elongation that the teeth cannot be brought properly together. Pain is heavy, but intense, the whole jaw sympathizing. If the case is allowed to run its course, the acute condition will continue from three to six days, terminating, most likely, in suppuration. Pus will collect at the apex and about the root or roots of the tooth. Finally, after almost unbearable agony, it will induce, by the pressure from its presence, absorption of the confining bone. The pus will now escape into the soft parts, and, after provoking absorption here, will discharge itself as a parulis, or gum-boil, and thus will end for the time the trouble.

Treatment by resolution is always in these cases to be attempted. The inflamed pulp should receive an immediate attention; or, if it be dead, it should be syringed from its cavity. Periodontitis is not unfrequently provoked by the presence of a dead pulp in a closed cavity. In these cases, the very first indication is the opening of such cavity. This very frequently will of itself yield a cure. Continued treatment consists, as suggested, in free scarification of the gum, and, after such depletion, the application of astringents. Leeches to the part act sometimes very happily. Hot foot baths, saline cathartics, and counter-irritants are also beneficial. Rest to the part is to be secured by heating a small piece of gutta-percha, and moulding it in the form of a cap over certain of the healthy teeth. A mouthful of cold water at once hardens this, and thus occlusion of the sound with the diseased tooth is prevented.

If matter forms, absorption of the bone and soft parts is to be anticipated by drilling, with a spear-shaped instrument, into the socket of the tooth. By this little operation days of suffering may frequently be saved.

Where, in ordinary cases, it is seen that resolutions cannot be

effected, and a patient will not submit to the operation of opening into the socket, abscess may be hastened by heat-retaining applications made directly to the part; of such applications there is nothing better perhaps than a split fig, roasted; warm fluids may be held in the mouth, etc. The treatment is to be conducted on general principles. Fever may be treated with the ordinary neutral mixture. A very good general febrifuge is that prescribed on a former page:

℞.—Liq. potassæ citrat. ℥iij;
Spts. æth. nit. ℥ss;
Ant. et potass. tart. gr. i;
Morphia acet. gr. ij. M.
Sig. Take in dessertspoonful-doses, pro re nata.

Periodontitis running into abscess is most apt to become chronic. A proper treatment is the daily injection of the sinus with some stimulant, than which there is nothing better than the tinct. of iodine, in varying strength, to suit the conditions. A very happy treatment in bad cases consists in keeping a tent stuffed into the tract, medicated with two parts of iodine and one part creasote. Constitutional tonic treatment is also commonly indicated. In my own practice I ordinarily direct a daily salt-bath, and fifteen drops, three or four times a day, of the following combination:

℞.—Tinct. ferri chl. ℥iij;
Quiniæ sulph. gr. xxv. M.

The ferrated elixir of cinchona is another very admirable preparation. It may be, however, that a patient does not require iron. In such cases the quinia alone, or its equivalent of the bark, may be prescribed. (See chapter on *Alveolar Abscess.*)

4th. *Confinement of Pus and Gas in the Pulp Cavity.*—When the dental pulp dies, decomposition follows. As the result of such lesion we have two sequences: either the decomposed matter is gradually absorbed into the dentinal tubuli, and thus gotten clear of, as exhibited in the opacity of the tooth, or otherwise it becomes a source of great irritation and offense to the surrounding healthy structures. Periodontitis is very apt to be provoked, the evolution of gases forcing the matter unduly into, and in many cases entirely through the foramen. If inflammation of the alveolo-dental membrane does not result, then the trouble induced becomes of the ordinary neuralgic character. The living nerve filament at the foramen, still more or less associated with its continuation ramifying in the

dead pulp, takes on inflammation, and thus irritability not only of this special filament results, but the whole trifacial tract is apt to sympathize. Some of the most severe and unbearable neuralgias I have ever treated, situated about the various parts of the head, have been quickly cured by discovering, and treating the cause in a confined dead pulp. I just now recall a marked example,—a patient of the late Dr. Elisha Townsend, treated by me for that gentleman during the sickness which destroyed his valuable life. The patient was a professional man, and completely lost to all self-control, or reason, for a period of three days, from the effect of neuralgic pain running between the orbit and the dura mater of the anterior portion of the cranial cavity. In this case not the slightest complaint was made of any of the teeth. Examining the mouth, however, in the search for a cause, I discovered a half carious, and evidently dead lower bicuspid tooth, but with no connection between the cavity of decay and the pulp cavity. With a spear-shaped drill I effected this communication, and in a single instant the patient expressed himself as cured. Relieved of the pain, he fell into a sound sleep, which continued some fifteen hours; the next morning he went about his duties as usual.

Any and every portion of the head and throat, supplied by the fifth nerve, or, indeed, by its associate relations, may be the seat of reflex trouble from a dead nerve. Thus we may have odonto-gastralgia, odonto-cephalalgia, odonto-cardialgia, etc.—even sciatica has been cured by the extraction of a diseased tooth.

The common treatment of all such cases is to remove the tooth, or otherwise drill an opening into the pulp cavity. The relief experienced is generally almost instantaneous.

A tooth containing a dead pulp is distinguished by its loss of translucency when compared with its fellows, or in its opacity, exhibited by reflecting, through the means of a hand-mirror, the rays of the sun upon it.

5th. *Granules of Osteo-dentine in the Pulp.*—In rare cases there is found to exist an irritability of the dental pulp which exhausts itself in the formation of isolated granules of semi-bonelike character, which obtain lodgment in some portion or other of the organ, and become, in turn, the source of great offense to the parts, resulting indeed frequently in an odontalgia than which there are few severer forms. To diagnose this condition is an exceedingly difficult matter, and it can, perhaps, be best done by exclusion. The teeth in these cases present every appearance of the highest health;

no discoloration, no soreness on pressure, and not unfrequently are without the slightest local pain; this manifestation being situated in some distant part, as the ear, the eye, the scalp, etc. Whether, however, the pain may be localized or diffused, it is always expressed by the patient as being entirely unbearable, and is commonly more or less paroxysmal in character, thus being mistaken for idiopathic neuralgia, and frequently so treated. A case illustrative just comes to my mind. During a late session of the University of Pennsylvania, a student in the medical department applied to me, suffering from neuralgia, so severe as to have entirely incapacitated him for study for a period of some three weeks. During this time he had tried all the ordinary remedies which had suggested themselves, without finding the slightest relief. The pain varied between the tuberosity of the superior maxilla and the ear. The teeth, about the tuberosity, were as sound and as healthy looking as any I have ever seen; there was apparently no local lesion, while, on the other hand, the physique of the gentleman was not at all of the neuralgic type. I was perfectly at sea with the case, until, after a day or two, there came to my mind an instance of innodular calcification of the dental pulp I had once seen, where the patient had suffered in about a like manner. Now I was not prepared positively to affirm that here was a second case of calcification; but so well satisfied was I of the existence of such a condition that I requested and obtained the consent of the gentleman to be allowed to pass an exploratory drill into the pulp cavity of the wisdom tooth. The result was the finding of the pulp filled with osseous granules—granules of osteo-dentine, as they are technically termed. The extraction of the tooth was followed by the immediate cessation of all pain, and the patient was able to go from my office direct to lectures.

A marked case, where the lesion gives direct local manifestation, the pain being seated directly in the affected tooth, exists in the person of a professional friend. The gentleman may be said to be affected with a diathesis in this direction. More beautiful teeth than he possesses, or, rather, did possess, I have never seen; and yet, one by one, they take on this condition, exciting such maddening pain that, regardless of everything, he flies to extraction for relief. In this way, within the past few years, he has lost all his upper teeth.

The treatment of this form of odontalgia consists in drilling into the body of the affected tooth, and securing thus a cavity of retention; apply the arsenious paste as directed. There are, however,

cases in which, under these circumstances, it seems impossible to effect the destruction of the organ. Here there is nothing to be done but to extract the tooth or teeth.

6th. *Sympathy.*—Sympathetic toothache is most frequently found to be associated with teeth having a common period of eruption. Thus, if attention is called to an aching bicuspid, and examination discovers it to be in healthy condition, we will commonly find the primary lesion in either of the three fellow-teeth. If it is the first or third molar, or any particular tooth, that may be aching, the real seat of pain may be found in the associate organs. This is the first and most common relation of sympathy. Other and indirect causes exist in various directions, the most constant of such associations being, first, with the ear, second, with the uterus. (See *Neuralgia.*)

7th. *Recession and Absorption of the Gum and Alveolus.*—When, for any reason, the gum falls below the enamel cap, the periosteum and cementum of the tooth becomes exposed to the various sources of irritation. The odontalgia thus provoked is seldom, however, acute or severe in its character, but dull and annoying. The practice in these cases is generally most unsatisfactory, resulting, sooner or later, in the necessity for extraction. If the recession is associated with acute conditions, treatment directed to meet the indications may result very well; but commonly such recession is slow and chronic, and admits of no remedy. Medicaments to neutralize or correct irritative conditions in the oral fluid sometimes are demanded, and answer a very good end. Of such neutralizing agents, acids or ant-acids are employed, according to the indications yielded to the test by litmus paper. I myself generally use lime-water in the one direction, or very dilute citric acid in the other.

CHAPTER XI.

DISEASES OF THE TEETH.

SALIVARY CALCULUS.

Salivary Calculus or tartar is that limelike material so often seen collected about the necks of the teeth. Observation elicits the fact that the primary seat of deposit is about the posterior or lingual faces of the inferior central teeth and the buccal aspect of the superior molars; as in these situations exist the outlets of the salivary secretions, the inference is made for us that from such secretions comes, in part at least, the deposit.

Analysis of Saliva.	Analysis of Salivary Calculus.
Water.	Carbonate of lime.
Ptyalin.	Phosphate of lime.
Fat.	Fat.
Chloride of sodium.	Mucus.
Chloride of potassium.	Accidental matter.
Phosphate of lime.	
Sulph-cyanide of potassium.	

When the salivary secretions are sluggish, the inorganic material, not being held in solution until fairly ejected into the mouth, becomes deposited about the roughened and inviting surfaces of immediately neighboring teeth. A nucleus once fairly formed, the secretion goes on until serious secondary lesions are apt to result.

The first and most marked effect of salivary calculus is upon the teeth; beginning upon one face, it soon involves the whole tooth, and, if undisturbed, envelops, sooner or later, in an imperfect sheath, the whole denture. A mouth so filled with tartar is not only one of the most disgusting, but, as well, one of the most unhealthy conditions presented in that cavity. Salivary calculus soon destroys the integrity of the teeth. It does this by its effects on the secretory crypts about their necks and by compelling the diminution of the periosteal supply; this membrane dying little by little as the foreign body encroaches on it. As a result of such abstraction of nutrition,

the tooth soon dies, and is exfoliated as any other sequestrum; tooth after tooth dies, and each week or each month one or more drops from its socket.

Not unfrequently there may be seen standing, isolated and alone, on some portion of the dental arch, most frequently, however, either on the anterior portion of the inferior arch, or the posterior portion of the superior, a yellowish-looking tumor, which might not inaptly be compared to a shellbark, covered with inspissated mucus. Sometimes this tumor will be found quite firm in its position, seeming, indeed, as if it might have sprung from the socket of some long ago extracted tooth; at other times you will be able to move it quite freely, as if it had a fleshy peduncle. These tumors give to the patient a most disgusting appearance, are insufferably offensive, and so detrimental to health that five or six grains of their substance, given to a small animal, will not unfrequently cause its death. The composition of such tumors consists of phosphate and carbonate of lime, epithelial scales, inspissated mucus, and the various débris of a cavity devoted to mastication. In other words, they are salivary calculi. The nucleus of such a growth is of course a tooth. The manner of formation is too evident to need description. I have removed these calculi, where the nucleus had become so encysted, from crown to apex, that no trace of it was to be discovered without dividing the mass. Where, however, the encystment has advanced to this extent, the tumor is about ready to drop from the mouth of its own accord.

I have seen a calculus of this kind encyst the six lower front teeth, making as strange a looking tumor as could be well imagined.

Similar calculi develop, as may be inferred, in other parts of the mouth. Thus, just within the orifice of the duct of Steno they may occasionally be found; the tumor, in such a case, bulging out from the cheek against the second molar tooth of the upper jaw. The formation of such tumors, in these situations, does not necessarily imply the closure of the orifice of the duct: they form when the gland is sluggish; the secretion not being in sufficient abundance to hold the lime of the saliva in solution until it is ejected from the duct, it falls on the floor of the duct, and, lodging, makes the nucleus.

I remember, on one occasion, to have been called by a fellow-practitioner to see a case where a mass of this calcareous matter, quite the size of the largest almond, seemed to be growing from all

that portion of the sublingual region anterior to the gland of that name; one-half the tumor looked as if it might be below the level of the floor of the mouth, the mucous membrane enveloping the mass with ragged and ulcerated edges. It certainly presented a very strange and threatening look. My friend was deceived as to its character, because there was no apparent direct association between the tumor and the neighboring teeth; and because it was as firmly fixed as though it might have been a growth springing from neighboring bone. Yet this was a salivary calculus and nothing else, the only question being as to its cause and fixedness.

Looking about the mouth, I perceived that the patient had certain artificial teeth on the left side of the arch; these teeth were all coated with tartar, and so associated thereby with the natural teeth as to be only distinguishable by that difference in the translucency so immediately noticeable by any one experienced in such direction. Knowing well that it is a plan with many dentists to secure such teeth by passing a strong gold wire across the mouth, and which wire not unfrequently buries itself within the mucous membrane, thereby occasionally quite concealing it, I inferred at once that this would be found the nucleus of the calculus, and accordingly so directed an examination. This was commenced by cutting away the calculus from about the artificial teeth, and, as anticipated, the band was revealed; next was sought the concealed attachment of the opposite side, and this being discovered and exposed, the two ends were forced from the teeth which they clasped, and thus the artificial teeth, wire, and calculus were lifted from the mouth in a body.

The site of the calculus, as may be inferred, presented a cup-shaped ulcerated depression, and was quite angry-looking.

The only after-treatment consisted in the use of an astringent wash. The ulceration healed kindly in a very few days.

I may suggest that the existence of such calculi is not an unfrequent cause of dyspeptic and other alimentary troubles. I have just now, in my mind, the memory of a case of dyspeptic consumption very illustrative.

In her mouth, the patient, a lady, had but a single tooth, and this for years had been so imbedded in salivary calculus as much more to resemble a half-rotted shellbark than a tooth—her breath was made insufferable by it. I removed the offensive mass, and the recovery of the patient was really magical in its rapidity.

Such calculi are to be removed in any convenient manner; they may be pulled away, broken away, or, when loose, may be cut from

the gum; the operation being entirely a mechanical one, and of course very simple.

I forget, however, in such advice, my reference to calculi situated in the duct of Steno. These are to be removed, either by enlarging the duct and crushing the stone, or otherwise by cutting down upon it at the most convenient point. When so cut upon, the wound will not commonly require any after-attention.

Mrs. Boyd, a lady, sixty-nine years of age, residing on Sansom Street, West Philadelphia, applied to me, being directed by some unknown professional friend, concerning a tumor of the mouth, from an inflamed condition of which she was at the time enduring much suffering.

Ocular inspection revealed the following condition: a tumor, very scirrhus-like, hard, lobulated, and angry-looking, occupied all that portion of the floor of the mouth, to the right of the mesial line; general inflammation of the whole oral cavity, to such extent as to make mastication too painful to be practiced, and to render deglutition very difficult. All the teeth in the neighborhood loose, and occupying irregular positions, the result, evidently, of a hyperplastic condition of the alveolo-dental membranes. The superficial cervical glands, especially those of the submaxillary region, sympathizing to a considerable extent; while the submaxillary gland itself was so enlarged as to render it sufficiently prominent to be easily mapped out.

The patient seeming unable to talk of anything except her present great pain, which she described as cutting, tearing, burning. I dismissed the case for the day, after prescribing for her immediate relief, namely, the ordering of leeches, aperients combined with Dover's powder, astringent local applications, etc.

Two days after, I again visited the case. The general inflammation was resolving very rapidly, while the mental equilibrium of the patient was quite restored.

The disease had been pronounced cancer by several gentlemen, and advice given that no application of any kind should be made to the tumor; that the patient should not even permit it to be handled for any further examination. Under this impression as to its character, the lady had given up all hope of any permanent relief, and was awaiting the end she expected.

The history of the case is as follows:

Eighteen years before, while engaged in milking an intractable cow, the patient received under the chin a kick so severe in char-

acter as to confine her to bed for over two weeks. This trouble gotten through, the parts soon recovered their natural tone, and seemed as well as ever.

A little over nine months had passed, however, before she was made conscious of occasional slight inflammatory attacks about the region of the sublingual gland. These attacks continued to grow in frequency and extent, terminating, to use her own language, "by a something which looked like a whitish worm, coming from somewheres, into her mouth." This worm, she said, "was always the assurance to her of immediate relief."

The trouble continued to recur for over a year, when a tumor began to develop in the parts. The inflammatory attacks now decreased in number, but increased in severity—the patient noticing that after each inflammation the size of the original tumor was augmented.

So the case ran on for a period of several years. It was remarked, however, nearly ten years back, that the tumor had ceased to enlarge from the inflammatory attacks, having at that time gained the size of a pullet's egg, and neither increasing nor decreasing up to the time of my examination. Understand me to refer to the tumor in a quiescent state, for each succeeding inflammation swelled all the parts, tumor included, temporarily, more than the one which had preceded it.

The patient's general health was quite good; there was no constitutional evidence to be perceived of the cancerous cachexia.

Now, while the history of this tumor, in its local features, was in many points the history of cancer, yet, considering its location, considering the affection of the gland duct, which, as indicated by the story of the worm, evidently had association with the tumor; considering the inflammatory attacks to which the parts had been so frequently subjected, and which had resolved harmlessly; considering the length of time the tumor had existed, without passing or apparently tending to pass to the ulcerative stage; considering these features in a diagnostic point of view, I decided, and felt firm in the decision, that the tumor was benign, and not a cancer.

What then was it? The trouble commenced evidently with inspissated ranula. My conviction, founded on the history, was, that it was still a ranula. Not ranula, as derivatively we understand the meaning of that word, but ranula, as pathologically the term has association with the salivary ducts. What the contents

of such cyst, if cyst there was, might be, I did not feel prepared to decide.

Acting on the strength of this conclusion, I suggested to the patient my impressions, and requested to be allowed to pass a scalpel through the parts. This, however, met with a most decided negative,—the refusal not being, perhaps, so very strange, considering the assurance that Mrs. B. had so often received, that any attempt to operate would be her death-warrant.

Failing in several other attempts at persuasion, I became, at length, annoyed at the obstinacy of the patient, and dismissed the case.

About a month after, however, prompted by curiosity, I called again on Mrs. Boyd. There was now not the slightest evidence of inflammation about the parts. The tumor was about the size of a pullet's egg, hard almost as stone, and distinctly divisible into three lobes. The patient assured me that, with the exception of an occasional sharp pain, she felt little or no inconvenience.

At this visit, more than ever satisfied with my diagnosis, I reurged an operation, but which was as decidedly refused as before.

On a Saturday morning I was again called to see the patient. She was suffering from another of the inflammatory attacks: the most severe she had ever experienced.

Examination discovered the tumor swollen to such an extent as to throw the tongue over into the left cheek. Mastication had been impossible for three or four days, while the ability to swallow was being very rapidly lost; yet with all this inflammation, there seemed no tendency to the formation of abscess.

Placing the old lady in an arm-chair, before the window, without asking permission or offering any suggestion, I managed to get the mouth under my control, and, before she was aware of the intention, I passed a bistoury directly through the body of the tumor —the knife grated over some hard substance.

After a time spent in making peace, in which I was greatly assisted by the assurance I was enabled to give of the dicovery which would result in her immediate cure, I proceeded to the dissecting out of the foreign body. This, as anticipated, proved to be a salivary calculus. The specimen is now in possession of my friend, Dr. D. H. Agnew, to whom I presented it for the pathological museum of the Philadelphia Hospital, and is, perhaps, one of the largest on record.

The pathology of such a lesion is at once appreciated, the forma-

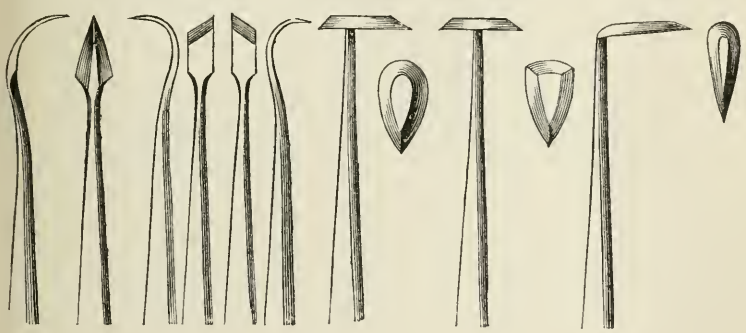
tion of the calculus in this region was merely secondary to the occlusion of the mouth of a gland duct.

Dr. J. J. Woodward, who made an analysis of a portion of the calculus, informed me that he found it composed almost exclusively of the phosphate of lime, only a very small trace of the carbonate being perceptible.

Saw Mrs. Boyd, for the last time, one month later. All induration had so completely disappeared that I think it would be difficult for any one who had not seen the case to say which side of the mouth the tumor had been removed from; not the slightest perceptible tendency to ranula being visible.

The treatment of the ordinary collections of tartar is very simple, and may be made very effectual. Various cutting and scraping instruments, very well understood by glancing at the engravings, are used in the process of removal. The operation consists simply in scraping away the mass, being careful not to scratch the enamel, and afterward polishing the teeth; using for the purpose, first, pulverized pumice, afterward an ordinary burnishing instrument.

Fig. 40.—Instruments employed in removing Tartar from Teeth.



To prevent re-collection, the action of the glands is to be increased, either by local or constitutional sialagogues, as seems indicated. Or if the practitioner doubts, in any individual case, the advisability of such prescriptions, then pumice-stone, finely pulverized, may be used with a good stiff brush; or, what I think will be found a still better plan, the patient may, each few days, standing before a mirror, use the pumice on a piece of soft pine or orange stick.

Salivary calculus has been thought to produce caries and necrosis of the alveolar processes. I do not, however, remember in my own practice ever to have seen such a result. As the teeth drop out the calculus falls away with them, and thus its power for evil ends. A spongy and scorbutic character of gum tissue, and consequent hemorrhage, are very common associations; but the practitioner at once sees that the cure is in his own hands.

CHAPTER XII.

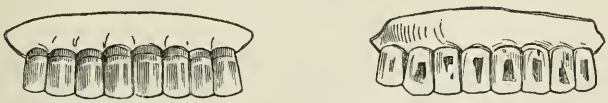
DISEASES OF THE TEETH.

DENUDATION.

This affection, at once appreciated by referring to the drawings, is, without doubt, one of the most deforming conditions to which the dental organs are subject. It is sometimes seen attacking every individual tooth, at others, confining its ravages to a very few. A very common seat of the affection is where the gum festoons. Here may be seen a sulcus or groove passing from tooth to tooth, involving all those situated in the anterior part of the arch. Another form of the affection involves the cutting edges alone, while in still other cases the depressions are situated promiscuously over every portion of the teeth.

The disease, commencing as a slight gutter or break in the enamel, progresses with a varying degree of rapidity, sometimes

Figs. 41 and 42.—Denudation.



moving with such slow pace as scarcely to be observed from year to year; in other instances, and these, unfortunately, much the most frequent, making constant attention necessary to the preservation of the organs. Occasionally the process begins at a number of points, and these enlarging, finally coalesce, to the destruction not unfrequently of all the anterior enamel wall.

Concerning the cause or causes inducing this condition much diversity of opinion exists. My own conviction is that it is markedly a disease of predisposition, the result of impressions made on the enamel at the period of its formation, and which predisposition has never by accident or design been corrected. Why some of these teeth should denude rapidly and others slowly must depend on both intrinsic and extrinsic circumstances. That these circumstances,

however, are not appreciated from that practical stand-point which should enable us to use them for the benefit of the patient, is unfortunately too true. Except as a mechanical treatment is concerned we can only look on, and trust for a speedy and limited line of demarkation. I am in the habit, however, of prescribing freely of the lime tonics; but whether such treatment does any good I do not feel myself able to say.

Another source of dental trouble in this direction arises from spontaneous or mechanical abrasion of the cutting edges of the teeth. Spontaneous abrasion is a most infrequent affection, and where not traceable to mechanical action is too obscure to permit the venturing of an opinion. The supposition that the parts are chemically destroyed by the secretion of an acid secreting gland, which it is claimed has been discovered in the apex of the tongue, is akin to many similar suppositions.

Abrasion of the teeth from mechanical causes is a very common affection, and a very unfortunate one. The articulation of the two dentures has much to do with the production of such a condition; indeed, everything, if we would except an abnormal softness of enamel as found in certain teeth. Teeth that articulate scissor-fashion, the one set over or in front of the other, seldom suffer from this trouble. It is most markedly an affliction of direct articulation.

Persons having jaws thus articulated find their teeth year by year wearing shorter; and was it not that, as this abrasion goes on, nature offsets the waste by internal repairs, throwing out layer after layer of osteo-dentine, the dental pulps would be quickly enough exposed.

The character of food used, while perhaps it would never yield this condition, yet the predisposition in the articulation existing, without doubt assists in the destruction. Thus it is remarked, that sailors eating constantly of hard bread, and chewers of tobacco, are most subject to abrasions; but this is only true strictly as it applies to such as have this peculiarity of articulation, and with such the progress of the abrasion is very rapid.

A means of relief, which, while fairly successful, is associated with much discomfort, consists in the adaptation to the posterior teeth of caps of metal; these caps take the strain off mastication, and thus protect the teeth. Another mode, but which is apt to excite odontitis, consists in cutting out cavities from the abrading faces of the teeth, and supplying the place of the removed dentine with plugs of gold. This latter plan has many advocates, and is highly commended by practitioners of experience and judgment.

CHAPTER XIII.

THE EXTRACTION OF TEETH.

THE extraction of a tooth is an easy or difficult matter, according as the principles involved in the operation are clearly or obscurely comprehended. In the adult mouth there are thirty-two teeth, and these, as the study of their extraction is concerned, are comprehended under six classes.

FIG. 43.—DIAGRAM OF TEETH.

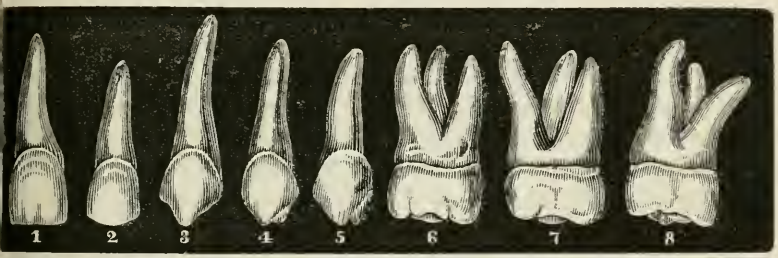


FIG. 44.

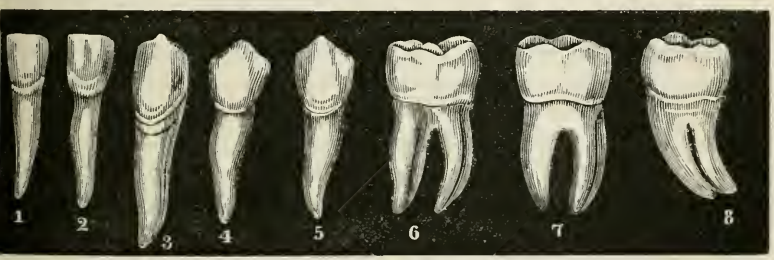


Fig. 43, permanent teeth of upper jaw. Fig. 44, of lower jaw. 1, 2, incisors; 3, canine; 4, 5, bicuspids or small molars; 6, 7, 8, large molars or grinders.

The first of these classes embraces the eight central and lateral incisors; teeth with cone-like roots, and accommodated in alveoli representing hollow cones.

The second class embraces the cuspidati, and are represented by the partly flattened cone.

The third class embraces the bicuspidati, and are represented by the flattened cone.

The fourth class embraces the superior first and second molars, teeth having three roots, two external cone roots, situated antero-posteriorly, with the interspaces looking toward the cheek; the third, generally a flattened root, looking toward the palatine arch.

The fifth class embraces the inferior first and second molars, teeth having two roots, one looking anteriorly, the other posteriorly; the interspace looking outward and inward.

The sixth class embraces the four wisdom teeth. These are single-rooted as a rule, with a curve looking backward.

To extract a tooth of the first class, the application of the force is required in a twofold direction, rotatory and downward, or upward, as the case may be.

To extract a tooth of the second class, the force is required in a threefold direction, downward or upward, lateral, and rotatory.

To extract a tooth of the third class, upward or downward, and lateral, or inward and outward, as one loosens a nail.

To extract a tooth of the fourth class, the same application of the force; one-half of such a tooth is, however, to be extracted at a time—that is, we first break the attachment of either the inner or outer roots, and feeling these yield, the force is instantly brought to bear upon the other. In extracting teeth of this class in this manner, much care is necessary in guarding against a too great extent of lateral motion; otherwise the roots, instead of yielding, will be found to break, thus complicating matters very seriously.

Teeth of the fifth class require the lateral and direct application of the force; they are to be gently rocked inward and outward until felt to yield, when they are at once to be lifted from their sockets.

Teeth of the sixth class are to be carried backward and upward, or downward, in the line of the axis of their single curved root; such applications will make easy an extraction which might otherwise be attended with much risk.

INSTRUMENTS.

Instruments are now made in consideration of the anatomical peculiarities of the teeth for which they are intended.

Figs. 45 and 46 represent instruments adapted to the formation of the incisors, both of the superior and inferior jaws.

Fig. 45 represents, when closed, a hollow cone, the least circum-

ference of which is at the free edge. Reference to the incisor teeth exhibits them as double cones, the base abutting just external to the alveolar process. This instrument, if thrust beyond the bases of

FIG. 45.—INCISOR FORCEPS FOR SUPERIOR JAW.

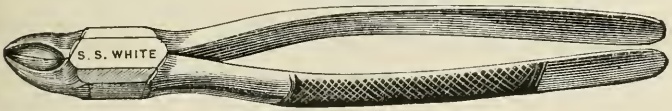
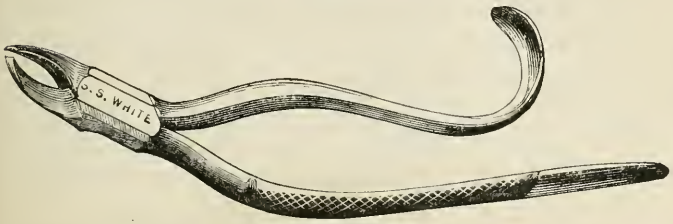
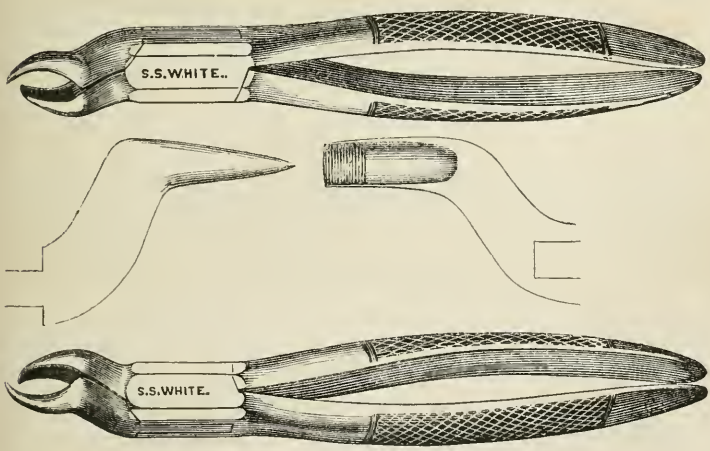


FIG. 46.—INCISOR FORCEPS FOR INFERIOR JAW.



the cones, is found to have the firmest possible hold of the tooth, and to fit it perfectly in its various diameters. To apply it, if the tooth is situated in the superior jaw, the operator stands to the right

FIG. 47.—THE MAYNARD FORCEPS—RIGHT AND LEFT.



of his patient. If the lower jaw is the seat of operation, I think it will be found most convenient to seat the patient upon a low chair,

and stand directly back of him, using the curved forceps, and leaning over his head to make the extraction.

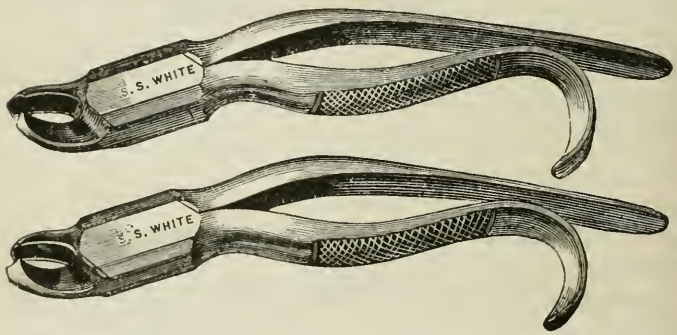
The same instruments apply equally well to teeth of the second and third classes; the straight forceps for the superior jaw, the curved for the inferior. The applications imply the same positions.

Than the Maynard forceps (Fig. 47) nothing, I think, could be devised more happily meeting the anatomical requirements of class four.

The outer beak, horn-shaped, is designed to slip in the interspace between the two buccal roots. The inner beak, flat and grooved, fits accurately and firmly against the palatine fang. These forceps are, of course, in pairs, and apply, the one to the right side, the other to the left.

Other forceps are also in use for the extraction of these teeth, and it might be desirable to have one set at least beside the Maynard.

Fig. 48.—The Ordinary Molar Forceps—Right and Left.

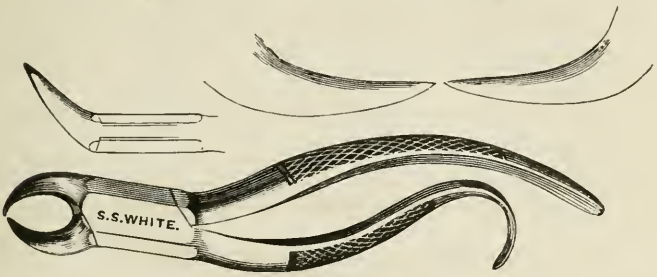


To apply these forceps the operator stands to the right of his patient, precisely as in the case of teeth of the first three classes, the left arm passing around the head, the fingers of the left hand holding the lip out of place. In using the Maynard forceps care must be taken to thrust the point of the horn directly into the interspace, otherwise the operator would have no hold on the tooth; this being in position, the flat blade is carried along the palatine fang as high as possible. A few rocks of the tooth inward and outward, combined with a direct force in the line of its long axis, and it will be found to give way.

Fig. 49 represents a forceps, invented by the same gentleman, for the extraction of class five. This consists of two hornlike beaks, which, as is seen by reference to class five, are admirably adapted to

the interspace looking outward and inward. To apply this forceps, which is equally adapted to either side of the mouth, the patient is to be seated upon a low chair, while the operator stands behind and leans forward over the head. The gum being well lanced, the beaks of the forceps are thrust down until they are felt entering the interspaces, the exact center line of the tooth corresponding to this space.

Fig. 49.—Maynard Forceps for Inferior Molars.



So direct and happy is the application of force with this instrument that it is not unfrequently the case that the simple closing of the handles will cause the tooth to start from its socket. A few rocks, however, inward and outward, will always easily effect the extraction. The great advantage of the instrument over such as are ordinarily used, is markedly evident where a tooth is much decayed about its crown; the instrument lifting from beneath rather than exerting pressure upon the crown. These instruments of Dr. Maynard cannot be too highly applauded.

Fig. 50.—The Physick Forceps.

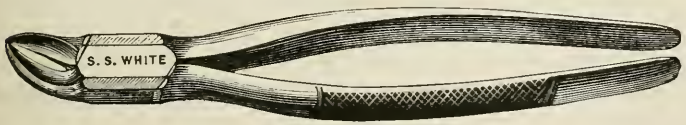


Fig. 50 represents a forceps, designed by the late Dr. Physick, for the extraction of the wisdom teeth. This instrument, as is seen, is a double inclined plane, and, in consideration of the necessity of throwing these teeth backward, is designed to be applied between the tooth to be extracted and the one directly anterior to it. The closure of the handles is expected to throw the tooth from its socket.

It sometimes occurs, however, that these teeth, as is seen in the

superior tooth in the drawing, have more than a single root; and these roots, instead of being inclined in a common axis, are frequently spread out in various directions. In cases of this kind it is plain that the instrument would not apply. Another objection to its use lies in the injury apt to be inflicted on the anterior or fulcrum tooth; this not unfrequently having the enamel so crushed and broken as to expose the more susceptible dentine, and thus lead to caries. Still another objection lies in the contusion inflicted on the periosteum, this membrane being occasionally so injured as to result in its severe inflammation.

Fig. 51.—Forceps for Wisdom Teeth.

Fig. 51 is an instrument, a modification of Maynard's cow-horn, employed by myself in the extraction of this class of teeth, and which I find to answer the end very satisfactorily.

With this instrument, bent, as is seen, at nearly right angles, one has little difficulty in getting at either upper or lower teeth, and the inclination backward is not at all difficult to be given. Two pairs, right and left, are required. The ordinary key instrument, if lightly and delicately made, answers a very admirable purpose with this class. The roots being generally quite short, there is none of the common danger of alveolar fracture, and being but lightly set in their sockets, and easily yielding, the application of but very little force is required.

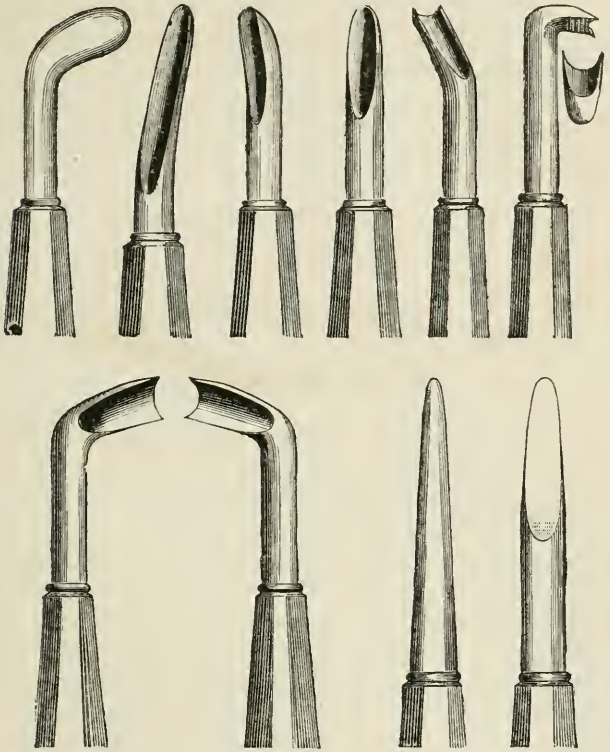
In using the key, the fulcrum should be placed on the inner face and well back upon the tooth, the claw being upon the opposite face and well in front; this application allows of the proper direction of the force, and admits of the easy and natural removal of the organ.

Another instrument employed in the extraction of these teeth is the elevator.

To apply this instrument, the grooved face is laid against the antero-lateral aspect of the tooth, and being carried down to the process, the hand is depressed so that the free edge alone impinges; the tooth is then pushed outward from its socket, and backward. When wisdom teeth are not too firmly adherent, this is an admirable in-

strument for their removal; care, however, is necessary that it shall not slip from the tooth and inflict injury on the neighboring soft parts.

Fig. 52.—The Elevator—Various Forms.



Extraction of Fractured Teeth and Roots of Teeth.—It not unfrequently happens that in attempts to extract teeth, fractures result; and such fractures must, of course, present the greatest variety of aspect, and require various resources for the removal of the parts left.

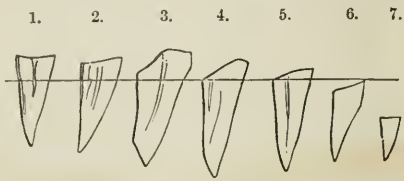
Teeth of the first, second, and third classes present the same common features of fracture, and may claim a first attention. Fig. 53 represents the alveolar line, and the various relations held to this line, or free border, by fractured teeth or roots.

A fractured tooth, as represented by Subfig. 1 (the first root to the left), is placed in no worse condition for easy extraction than

before the occurrence of the accident. The same forceps and the same manner of its application still apply to it.

Subfig. 2 represents a slight modification of the same condition. The one forceps and the one application still, however, apply. It is advisable, if the tooth is at all brittle, to work the blades of the instrument well beneath the alveolus. This affords greater support and yields increased security.

Fig. 53.—Relation of Fractured Roots to Alveolar Line.



Subfig. 3 may represent a bicuspid tooth with the crown half broken away. In such a case, if the remaining portion is not at all brittle, and if the process is soft and spongy, the forceps, as described, having well-sharpened blades, may again be tried, working them well beneath the process, and securing all the hold possible on the root. If fracture again occurs, which, indeed, is very likely, simulating figures 4 and 5, the cutting forceps is to be employed.

To use a cutting forceps, make, with a scalpel or other blade, an incision on either side of the root through the soft parts directly down to the process; these cuts must correspond with the exact center line of the root. The forceps is now to be applied scissors-fashion, cutting directly through the bone. Being thus brought in contact with the root, and grasping it perhaps full half its length, the removal is, of course, a perfectly simple matter.

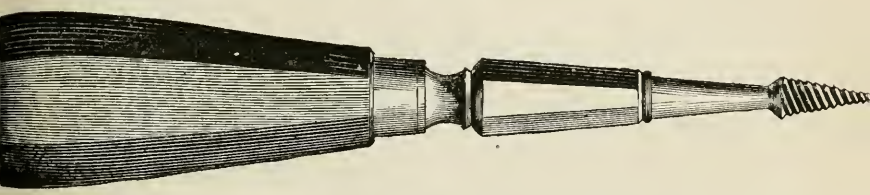
Some operators prefer to precede the cutting forceps with the elevator, and this instrument, in many cases, certainly effects the end very well.

In the application of the cutting forceps, it not unfrequently happens that, from want of care, the blades, instead of coming directly upon the root, slip to the back or front of it. In these cases the fang may generally be easily enough picked out with the ordinary root forceps. A form of cutting forceps used by many, consisting of a double curved blade, avoids this accident, but it is to be objected to on account of the wound it makes.

Roots, represented in 4, 5, 6, and 7, are removed on a common

principle. The first attempt is to be made with the elevator: laying the groove of this instrument closely against the root, its sharpened knifelike edge is insinuated between the fang and process, being worked down as far as possible. The handle is now carried obliquely to the line of the root, and thus, with careful yet oscillatory motion, the piece is forced from its bed. It is very well known, however, that with a dense, heavy, alveolar process, this instrument cannot be made to operate so happily, it being next to impossible to insinuate it between the bone and tooth. Under these circumstances, another instrument, the screw, may be brought into requisition. See Fig. 54.

Fig. 54.—The Screw.



The screw is designed to operate upon the tooth root as the spiral operates upon the cork. Well tempered, and very sharp, it is introduced into the pulp canal, and quietly and gently turned until it has taken a firm hold. A simple direct movement, and the root is brought away.

It may happen, however, that no hold sufficiently firm for the extraction can be obtained with this instrument. When this is the case it may be laid aside, and the always reliable cutting forceps brought into requisition. If preferred, however, the screw can be bored into the tooth until fracture is produced, and this will sometimes enable us quite easily to pick away the splinters: particularly will this be found to be the case when the line of the fracture divides the root in its length.

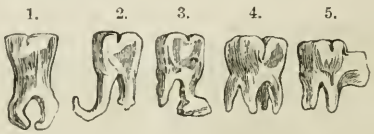
Roots of the molar and wisdom teeth, superior and inferior, are removed on a common principle. In the use of the elevator, a very happy result is not unfrequently secured by applying the blade to the inner face of the root, carrying the shank across the mouth, and making a fulcrum of some convenient opposite tooth.

Where the roots of a molar tooth are so firmly fixed as to seem incapable of removal with the application of an ordinary amount of force, it is better to divide them. This is easily done with the

cutting forceps, and, after the separation, each root may be picked out singly, and generally with comparative ease.

Deformed or Anomalous Teeth.—Understanding the principles on which teeth of ordinary character are extracted, the practitioner needs little instruction so far as anomalies are concerned.

Subfigures 1, 2, 3, 4, and 5 represent five anomalies, and they may very well stand for the class. In removing such teeth from the mouth, the matter of greatest importance is to recognize them. Now, while this cannot in all cases be done so as to appreciate exactly the condition of the roots, yet we can always say that some impediment to the removal exists; and this, after all, is the most important matter, as it influences us in the amount of force exhibited, and



which, too freely rendered, might result in fracture of the bone, or still greater injury to surrounding parts.

A tooth, as represented in Subfig. 1 (the first to the left), will generally yield in its roots so as to pass the intermediate piece of process. If it does not so yield, then this wedge of bone will fracture and be brought away. Such fracture, however, results in no harm, and is to be esteemed of little consequence.

Subfig. 2, by the great curve in the root, is made incapable of passage, unless, after being loosened, it is carried outward in the direction of the axis of the curve. In this way it is easily removed. The character of the curve is recognized by the resistance offered when the tooth is carried in certain positions, and the absence of such resistance when carried in the proper line. The attempt to remove such a tooth by simple force would result either in fracture at the curve, in lifting out a neighboring tooth, or in fracture more or less extensive of the alveolar process.

Subfig. 3 represents exostosis of a root. A tooth fang so enlarged will not pass through the process unless the bone is very open in its structure. Such a tooth may be made quite loose, but while it moves freely enough in its socket, it is felt to be held by something abnormal. To free such a tooth, it is only necessary to use the cutting forceps, or, what I prefer, take the ordinary small surgical chisel, and cut away sufficient of the process to admit of the passage.

This little operation is easy of accomplishment, and must prove adequate to the end.

Subfig. 4 represents one form of twin teeth. The two must be extracted together, which may be difficult or the reverse, according to the character of the process. It is well, before making the effort to extract, to free the process from the teeth as thoroughly as possible; this is done by a sharp and flat elevator or the chisel.

Subfig. 5 represents a second form of twin growth, the result of original germ union. If the offshooting bulb is situated within, and covered by the process, it is to be treated as if it were a case of exostosis of the fang. These germ unions are exceedingly rare, and one might not be met with in a lifetime.

CHAPTER XIV.

GENERAL REMARKS ON EXTRACTION.

The relationship of the teeth with the jaws is through the medium of a cellular process known as the alveolar. Each tooth has pits or alveoli corresponding to the number and character of its roots; thus, the central and lateral incisors, the cuspidati, and the bicuspidati, having each but one root, have each but one alveolus.

The molar teeth of the superior jaw have three roots, consequently a threefold relation to the alveolar process.

The molar teeth of the inferior jaw have two roots and two alveoli.

The wisdom teeth, as a rule, have a single short curved and stumpy root, consequently a similar alveolus.

The association of the teeth with their alveoli is through the medium of periosteal tissue; this membrane is coarse and fibrous about the free edge of the bone, loose and cellular as it gets deeper. A proper-shaped lancet may be made to excise the coarse fibers; consequently, the operation of extraction should always be preceded by that of thorough lancing. In this way much of the strength of the relationship of the tooth with its socket is to be overcome.

A tooth extracts difficultly or easily as influenced by the character of its periodentcum, and the loose or firm character of its alveolus.

A limited fracture of the alveolar process is generally not to be considered a matter of much consequence. If an extensive fracture should associate with an extraction, the tooth and bone may be laid carefully back in place, and treated as any common fracture; or, if this does not seem desirable, the fractured piece may be dissected from the soft parts, and the wound treated on general principles. Sometimes, when too much force is injudiciously used, a fracture may occur, including several teeth. In such accident, the circumstances of each peculiar case must direct the practitioner; they are ugly and generally unnecessary troubles, and not apt to occur where proper care is exercised. If I myself should meet with such an accident, I should certainly make a first effort to reunite the parts; failing

in which, I would have, of course, no resource but to dissect away the piece, or otherwise wait on nature for a process of exfoliation.

Laceration of the gums is an accident frequently associated with the careless extraction of teeth. Such laceration may be trifling or it may be serious, and is, perhaps, always to be guarded against by careful attention to lancing. A small piece of gum torn by a tooth as it comes away, had better always be removed; left in the mouth, it is a source of annoyance, and reflects, in the mind of the patient, on the practitioner. Large strips are to be carefully laid back in place, and secured by one or more stitches, or other convenient means of retention.

Hemorrhage.—Hemorrhage after extraction is influenced by two circumstances: the state of the parts and the predisposition of the patient. An ordinary tooth extraction is followed by hemorrhage lasting but a very few minutes. In extraction for periosteal trouble the bleeding is more profuse; but such hemorrhage, if at all reasonable, should not be interfered with; it expedites the cure of the case wonderfully, relieving the general congestion of the parts.

In cases, however, where a hemorrhagic diathesis exists, alveolar hemorrhage is not unfrequently of the most profuse character, making necessary the most judicious and energetic treatment for its arrestation. Two cases, occurring in the persons of father and son, will illustrate this direction of practice.

Mr. B., aged 19, applied to his dentist for the removal of the second superior molar of the right side. The operation over, the bleeding seemed not excessive, and the patient was dismissed as usual. On the same day, in the latter part of the afternoon, bleeding recommenced; Monsel's solution of the persulphate of iron was employed, and the patient again dismissed. During the night hemorrhage again recurred, and the family physician was sent for; the solution of iron was again employed, and a temporary arrest again secured. The next day it reappeared, and nitrate of silver was applied in the alveolus. This controlled the hemorrhage until the succeeding day, when it again appeared; and so off and on over a period of eight days. At this time I first saw the case in consultation, the patient being unable to swallow any other than liquid food, owing to the swelling of the fauces and œsophagus from the effects of the nitrate of silver.

In now treating the case we first took from the cavity the half-coagulated clot it contained, and, washing the parts thoroughly, discovered that the bleeding came not alone from the socket of the tooth,

but from about the margins which had been ulcerated by the various applications. The next step was to secure an impression of the roof of the mouth, which was obtained without difficulty through the employment of the common impression wax and cup. To this impression a silver plate was struck. The cavity was now carefully packed with lint saturated with a solution of alum, and over the bleeding gum was laid a thin piece of cotton stuff, saturated in like manner. The plate was now placed in position and firmly secured. Tincture of Erigeron Canadense was given in one-drop doses, repeated every few minutes, and the feet were placed in hot water, the patient sitting up. Hemorrhage ceased entirely in the course of an hour, and did not recur.

Mr. B., the father of this young gentleman, aged perhaps 50, suffered five days from hemorrhage, under the following circumstances. A wisdom tooth of the left upper jaw troubling him, because of its great looseness, he applied to his dentist for its removal. Not deeming it necessary or desirable to wound the gum, the practitioner extracted it without the preliminary step of lancing, and in the act was so unfortunate as to tear away a small strip. Hemorrhage was immediate, and more or less continuous. Monsel's solution being prescribed by his physician, it was employed, but with somewhat of the same result as in the son's case. On the evening of the fifth day I first saw this case; the patient was much weakened from the excessive discharge, and exceedingly frightened and nervous. Washing away the clots, I discovered the blood oozing from the torn gum, and not at all from the tooth socket. Commenced immediately to give the erigeron in drop doses, repeated every minute, and ligated against the wound a tuft of cotton saturated in the alum-water; the hemorrhage ceased entirely within ten minutes, and did not recur. As an assurance, prescribed the wine of iron, which the patient continued to take to the amount of four ounces.

Tinct. Erigeron Canadense, in cases of this character, seems to be a quite reliable hæmostatic; not entirely so, however, as I have prescribed it where it certainly failed to exert the slightest influence.

Opium and lead are valuable agents in hemorrhagic conditions—a pill composed of one grain of opium and two grains of acetate of lead will generally, if repeated each few hours, be found entirely reliable.

A hot pediluvium is an invaluable adjunct, being not unfrequently alone sufficient to the control of severe local hemorrhage.

The ordinary cobweb of the cellar is an excellent local hæmostatic; particularly reliable is it if saturated in water and mingled with bayberry powder. As a local application to large bleeding surfaces I know of nothing to surpass it. I used this once in the case of an infant laboring under profuse hemorrhage from lanced gums, and it controlled the bleeding almost immediately, although almost every conceivable thing had been previously applied without benefit.

Monsel's solutions cannot, I feel, be too strongly objected to as an application in oral, and, indeed, I think, in any other kind of hemorrhage. Or, if they must be used, the practitioner should never trust them in unskillful hands. They certainly will check a hemorrhage, but generally only temporarily. With the coming away of the clot the bleeding is almost sure to reappear, while hemorrhage, secondary to the use of the solution, is always more difficult to control than when no such preparations have been used; the application certainly lowers the vitality of parts. The best effects of the Monsel's solutions are secured by simply touching the bleeding part: to do more is to do harm. The common mode of saturating a tuft of cotton and packing it pell-mell into or against a part, is most reprehensible, and should never be practiced.

Of the hæmostatic effect of alum-water I feel I could scarcely say too much. I always employ it in the various operations about the mouth, and it seldom fails. In any ordinary venous or capillary hemorrhage, if assisted by proper adjuncts, it may commonly be depended on.

In persons of known hemorrhagic tendencies, the extraction of teeth, as well as the performance of any surgical operation, should be preceded, when possible, by a few days or weeks of preparatory treatment. Tinct. of the chloride of iron, in doses varying from 10 to 20 drops, should be given three times a day for one or more weeks. Conjoined with this the patient may take at the same hours as much Peruvian bark, the red variety, as will lie upon a silver half dime. On the day of operation three pills should be given, at intervals of one or two hours, each containing one grain of pulverized opium and two grains of acetate of lead. With such preliminary treatment little trouble need be apprehended from hemorrhage.

Rest is a valuable hæmostatic. A bleeding part should remain as quiet as possible, and, if possible, be kept well elevated. Compression of a bleeding alveolus or a bleeding gum can very well be effected by the use of a common bottle-cork; plugging the socket, or

laying the cloth over the gum, cut a concavity into one face of the cork and fit it over the parts; it is solidly retained in place simply by closure of the teeth; or, if the patient be a child, the head bandage may be thrown about the jaws.

Compression should be moderate and not severe, and once made, and the hemorrhage thereby controlled, should not be too hastily removed

Luxation of the Inferior Maxilla.—Occasionally, as the result of a sudden movement, or an abnormal laxity of the ligaments of the temporo-maxillary articulation, the condyloid process falls forward over the glenoid boundary. The patient is thus rendered unable to close the mouth, and is said to labor under luxation. (See chapter on *Luxation*.)

Local Anæsthetics in the Extraction of Teeth.—The employment of various local agents to secure exemption from pain in the operation of extraction, has of late commanded so much attention that no chapter on the subject of such operations would be complete without reference to the subject.

The most simple and, we may say, elementary application in this direction, consists in inclosing in a piece of bladder, or other convenient skin, a small portion of pounded ice and salt, and enveloping, for a few moments, the part to be operated on. To secure most conveniently the effect of such a process of refrigeration, various instruments have been devised, but none, so far as the application of the ice and salt is concerned, have been found to answer any better purpose than the bladder or skin inclosure. Such skins should consist of two little bags, one to rest upon the outer, the other upon the inner, side of the gum. To prevent pain from the application of the cold, the bags should be brought gradually in contact with the gums; or, what will answer a similar purpose, the application may be preceded by ice-cold water held in the mouth for a few moments.

An apparatus designed and manufactured by Messrs. Horne & Thornwaite, of London, is said to answer a very good purpose, and is thus described: "A required amount of water is cooled down, by means of ice and salt, to about zero, in a vessel called a refrigerator. To this vessel is attached another, called a graduator, containing warm water at about 100°, and so constructed as to allow the slow admixture of its contents with the chilled water in the refrigerator, and thus produce a gradually diminishing temperature, for the purpose of preventing sudden shock and pain to the teeth, which a direct application of cold would inevitably cause. A tube conveys

this graduated current into a terminal portion constructed of very fine membrane, which adapts itself to the form of the gums, and wholly surrounds the tooth to be extracted. The fluid then passes away through an exit tube. In this manner a constant current of cold, at a decreasing temperature, is made to pass over the part, abstracting therefrom all heat, and consequently all feeling."

The concentrated tincture of aconite is a useful local anæsthetic, but one that should be used with a considerable degree of caution. If a portion of this tincture be applied to one-half the lip, sensibility will be so interfered with that a goblet placed to the parts will appear as if broken.

A mixture of chloroform and laudanum in equal parts is much lauded by some. To apply this, it is only necessary to saturate a tuft of cotton, and lay it against the tooth to be extracted.

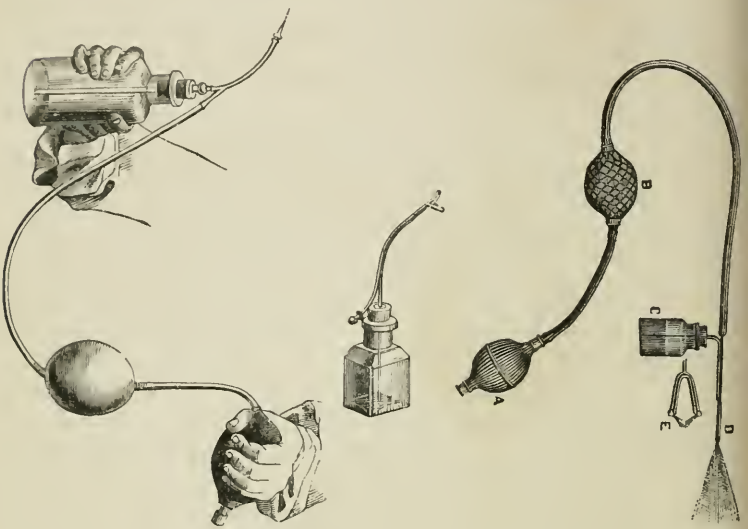
Electro-galvanism claimed at one time a good share of attention. Its application consists in applying one pole of a battery to the forceps, while the other is held in the hand of the patient; a gentle current is then to be let on, during the passage of which the tooth is extracted. This mode of effecting local anæsthesia is still practiced by very many; but I must say that, in my hands and in the hands of many experienced friends, it has proved a failure. Not that it is attempted to deny that in certain cases it does not seem somewhat to obtund sensibility, but in the majority of instances it either does no good at all or adds the discomfort of the current to the pain of the operation.

The application of the spray of ether and rhigolene is the latest, and perhaps the most worthy and reliable, of the local anæsthetics; certainly one may say reliable when employed for operations of limited extent about the soft parts, but as to its equal reliability in tooth extraction, my experience has not so well satisfied me. With these agents I have performed many operations as thus applied, in the way of the removal of sebaceous and other superficial tumors, the opening of abscesses, carbuncles, and similar operations, and the result has been everything I could have desired; but in its application to the teeth, the obtunding of the sensibility has not by any means been so marked; particularly has this been the case where rhigolene was used.

The process of freezing a part through the known refrigerant power of evaporating ether seems first to have suggested itself to Dr. Richardson, of London. An instrument, invented by this gentleman for the accomplishment of such an end, is here exhibited, forms of bellows for both hand and foot being represented.

For the spraying of any plain surface the simple straight tube is all that is necessary. For the teeth the double sprayer, as seen in the drawing, is used; with this instrument a continuous vapor is cast both upon the outer and the inner face of the gum, and congelation is rapidly induced.

Fig. 55.—Spray Apparatus—Hand Instrument.

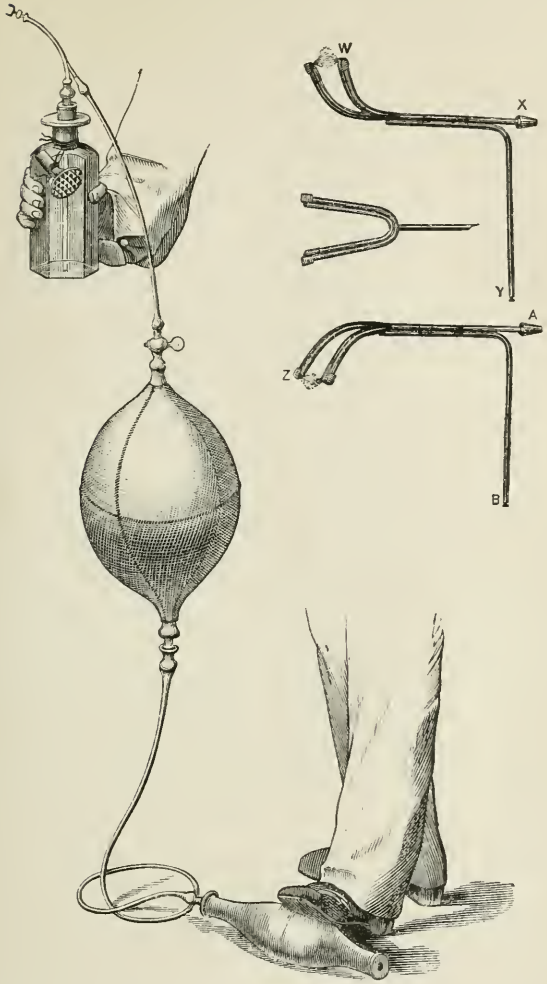


In using this hand instrument, the operator himself should not work the pump. A very few moments' compression of the ball renders the hand shaky and unmanageable.

Upon this instrument of Dr. Richardson's, modifications have already been made: of these, one by Messrs. Codman and Shurtleff, of Boston, has, perhaps, attracted most attention; it certainly seems to divide the ether more infinitesimally, thus insuring a more complete vaporization; but it has a weak point, in that the tube seems frequently to freeze or choke up, an accident that does not occur with Dr. Richardson's instrument.

An objection urged to the use of extreme cold as thus induced, is, that injury is done to the soft parts, as it is thought will be manifested in inability to unite wounds happily and easily. That such objection is, however, not valid, I have satisfactorily proven, for, if anything, parts thus operated on have united better and with less inflammatory reaction than has obtained where the spray has not been used.

Fig. 56.—Spray Apparatus—Foot Instrument.



Rhigolene, or hydro-carbon, manufactured from coal oil, and much vaunted by some, has not, in my hands, proven so satisfactory as ether. It certainly freezes a part more quickly than this latter agent, but this does not seem alone to be the object, as anæsthesia is not nearly so complete.

CHAPTER XV.

GENERAL ANÆSTHESIA.

"So long as pain is an evil, and ease a good,—so long, in other words, as man is man,—must any means be prized that is capable of achieving the latter by the abolition of the former. As, then, the pain of surgical operations is certainly of the most terrible of its class, and it is no matter of doubt that agents exist which possess the power of abolishing this pain, what remains for consideration is not so much whether this means shall be hailed as a matchless and priceless discovery and be cherished and adopted as a blessed thing,—this appreciation has been made, this adoption has been consecrated by almost universal practice,—what remains for consideration is, whether the good is a pure good, or is counterbalanced by evil.

"The obvious, open, palpable, glorious good of anæsthesia, and particularly ether anæsthesia, is to deliver the wretched victim of surgical disease from the additional torture of pain, while seeking the goal of health through the portals of chirurgery. The evils that have been said to follow or accompany this good have, however, been regarded by some as of so serious a character as not only to induce them to reject general anæsthesia in their own practice, but to denounce it publicly as a means that should not obtain with scientific and conscientious men.

"We confess that we are surprised whenever we hear these expressions, and, strange as it may seem, there are even now enough to give expression to them. Of the hundreds and thousands, we might say hundreds of thousands, who have taken ether to insensibility, we have been unable to discover, after the most extended inquiries, a single case which resulted in death, or left behind it consequences of serious importance that were certainly attributable to it. In a small proportion of cases there have, no doubt, been some unpleasant results, such as temporary depression of the vital powers; headache, more or less considerable, for some hours, or even days; hysterical excitement in women for a similar length of time; slight bronchial irritation, nausea, and sickness, and some other slight af-

fections; but the proportion of patients suffering, even in this slight manner, has been extremely small, indeed wonderfully small, when we consider the indiscriminate manner in which the practice has been had recourse to, with bad ether and bad manipulators. Indeed, that so very few, and such trifling accidents have occurred in such a state of things, is most convincing proof of the general safety of the practice. For, in considering the entire incompetence of the many who are in daily, fearless employment of the agent, so far from these uniformly innocent results being anticipated, one might very naturally look for others of a very different kind. We have ourselves been constantly looking for ill consequences, and we are still prepared to find them; but when they arrive, if ever they now are to arrive, we shall have to consider well, before condemning the agent, whether the event was a necessary consequence of its use, or merely an accidental result from its abuse."

The preceding very impartial and terse consideration of the general question of anæsthesia, as reference is had to its production by sulphuric ether, we find in a British exchange. The question, "To what are accidents (if accidents there are) attributable?" is naturally suggested, and would excite in the mind a desire to enter on the consideration of a subject fraught with such importance, before taking up its use or joining in the cry of those who abuse.

Such consideration I propose to make the subject of this chapter, and trust that not a little personal experience enjoyed will enable me to present it with some degree of clearness. We first consider sulphuric ether.

An agent, refreshing in itself, may, in improper hands, become a source of ill; this truth embraces the whole Materia Medica.

What is sulphuric ether?

"When equal weights of rectified spirits and oil of vitriol are mixed in a retort, the latter connected with a good condensing arrangement, and the liquid heated to ebullition, a colorless and highly volatile liquid, long known under the name of ether, or sulphuric ether, distils over. The process must be stopped as soon as the contents of the retort blacken and froth, otherwise the product will be contaminated with other substances which then make their appearance. The ether obtained may be mixed with a little caustic potash, and redistilled by a very gentle heat.

"Pure ether is a colorless, transparent, fragrant liquid, very thin and mobile. Its sp. gr. at 60° is about 720; it boils at 96° under the pressure of the atmosphere, and bears, without freezing, the

severest cold. When dropped on the hand it occasions a sharp sensation of cold, from its rapid volatilization. Ether is very combustible; it burns with a white flame, generating water and carbonic acid. Although the substance is among the lightest of liquids, its vapor is very heavy, having a density of 2·586. Mixed with oxygen gas and fired by the electric spark, or otherwise, it explodes with the utmost violence. Preserved in an imperfectly-stopped vessel, ether absorbs oxygen and becomes acid, from the production of acetic acid. This attraction for oxygen is increased by elevation of temperature." (*Fownes.*)

Dr. Jackson's formula for the preparation of ether for anæsthetic purposes is, we believe, as follows: procuring the strongest and purest rectified sulphuric ether—that just described—wash it well, to get clear of any acids, then decant from the water, drying it with chloride of calcium, to free it of any water that might otherwise remain from the washing.

This, however, is but a single formula. Different chemists gain the same ends through different processes. It is for the surgeon to buy of a reliable druggist rather than attempt, himself, the preparation.

This, then, is ether, an agent which experience demonstrates that, breathed into the lungs, will produce insensibility. To exhibit ether successfully, four essentials seem necessary:

1st. That the ether should be very pure.

2d. That the vehicle upon which, or with which, the agent is exhibited, should be of such character that full volume of atmospheric air is allowed to pass through the ether into the lungs.

3d. That the vapor of the ether be properly diluted, given for the first few inspirations comparatively weak, and increased in strength as the glottis, air-passages, and lungs can bear it.

4th. That insensibility be produced as quickly as the system will bear, as evinced by obvious signs.

A cone-shaped, close sponge is the best means for administering ether. This possesses every advantage, except economy in the administration, without having any of the common faults. From two to five minutes will be found the average time necessary to produce the full effect of perfect sleep, while cases will present themselves where double this time will be required, and where, indeed, it may be necessary to combine with the ether the more powerful effect of chloroform, or even to employ the undiluted chloroform. From an article emanating from a gentleman of much experience in

anæsthetic agents, we have the following: "It is possible to inspire three, four, nay, ten times the quantity of ether capable of producing sleep, without this state being produced, provided the vapor be taken in a too diluted form; and we believe this over-dilution and its consequent protracted inhalation is a frequent cause of the excitement which supervenes in the practice of many persons, while it so rarely shows itself in that of others. In these cases the patient may be made drunk; drunk in the first degree, but not dead drunk, the condition required for surgical purposes."

It will be remarked, let us notice in passing, that one of the most common objections of the opponents of ether lies at this door—this supervening state of excitement instead of the desired state of stupor; but does not the question again very pertinently apply, Is the fault with the agent, or with the operator?

The idea is to be conveyed that the effects of sulphuric ether and the common alcoholic beverages are the same. The effects of alcoholic liquids are too well known to require minute description. We have, first, the state of exhilaration, which gradually changes to complete stupefaction or narcotism. The last state, the result probably of a narcotized state of the brain. Just so acts ether, yet passing through its various stages more quickly, the result of its being poured in a continuous and undiluted stream upon the heart and brain. The ether is no sooner absorbed than the blood charged with it passes to the left side of the heart, and immediately thereafter is circulated through the coronary vessels, the carotid and vertebral arteries, and thus pervades the tissue of all parts of the heart, as well as of every portion of the brain. A writer, in an influential dissertation, presents an example in this wise:

"Suppose, to take an extreme illustration, that the blood was as capable of absorbing as much ether as water can combine with, or one-tenth its own weight. If, then, we suppose the blood in the lungs was impregnated to this extent, it would be applied in that state to the heart and brain; whereas, if the blood in the stomachic vessels was impregnated to the same extent with ether, before reaching the liver it would have mingled with more than its own mass of pure blood from the splenic and mesenteric veins. The tenth would then become a twentieth, and, on the blood leaving the liver and joining the larger current of the inferior cava, the twentieth would become a fiftieth or sixtieth; a further dilution would take place at the confluence with the superior cava, so that the blood, on reaching the heart and brain, instead of containing one-tenth part of

absorbed ether, could not contain as much as one-hundredth. When, therefore, the same quantity of ether, or any absorbable substance, is taken up from the lungs and from the stomach, it must, in the former case, be applied to the tissue of the heart and brain, in a state of concentration at least ten times greater than the latter, and will therefore act on these organs with more suddenness and energy."

The evanescence of the effect of ether, when compared with alcohol, is explained by a momentary consideration of the different manner of absorption. During the inhalation of ether, as we have just seen, the charged blood is applied to the heart and brain, while the blood circulating in the lower parts of the body contains a much smaller proportion of it. Now, on stopping the inhalation, the blood in the heart and brain speedily passes off by the veins, and is succeeded by the comparatively pure blood coming from the lower regions of the body, and so the narcotic symptoms disappear.

"It is far otherwise when alcohol is absorbed from the stomach, for the whole mass of blood must be impregnated with it before a highly charged blood can be applied to the heart and brain; and then the effect continues for many hours, till the alcohol has been thrown out of the system by the lungs and skin. With respect to ether, it must not be supposed that on the subsidence of the narcotism it disappears from the body; for it is merely weakened in its effects by being diffused over the whole mass of blood. This is obvious, from the smell of the breath for many hours, and from its frequently causing copious perspiration."

Does not the question here suggest itself, If the effects of ether and the common alcoholic beverages are so nearly alike, why the great dread of the one and the entire fearlessness with the other? Would not the answer seem to be something of this kind? Men when etherized are as dead drunk—our eyes are not well accustomed to seeing them but partly drunk. In this state they excite amusement—in the state of profound drunkenness they have always aroused our fears for their recovery. Associations have great weight.

The immediate and obvious effects of etherization on the individual hardly require notice, as they must be familiar to all our readers, if not from a personal experience, certainly from observation upon others. "All the usual phenomena of the deepest sleep supervene, gliding often into the profoundness of sopor and verging occasionally upon, if not actually lapsing into, coma. The voluntary muscles become suddenly relaxed, the jaw falls, the arms hang down,

the eyes roll upward under the lid, the respiration becomes slow and labored, and the face becomes either very pale or morbidly flushed; the aspect of things is truly such as can hardly be contemplated for the first time without alarm: the individual seeming, to the common eye, to be sinking into the sleep of death."

It is impossible, says another observer, to see a single case of etherization without being struck with its resemblance to asphyxia—and experiments exhibit a real relation between the two. But in ordinary asphyxia, the nervous system loses its power under the influence of black blood, or blood deprived of its oxygen. But in etherization it does so under the direction of this singular agent. This is really all the difference, for in both there is the same loss of sensation and voluntary motion, and the same, at least temporary, persistence of the respiratory movements. In one word, there is the same survival of the medulla oblongata over the spinalis.

"Etherization exhibits to us the entire mechanism of asphyxia—we mean the successive deaths of the various nervous centers. It isolates, just as mechanical experiments do, the intellectual powers, the co-ordination of the movements, sensibility, motility, life. The isolation of life—this point, this vital knot of the nervous system—forms the most striking point of the experiments.

"In an etherized animal one point alone survives, and while it does so, all others retain at least a latent life, and may resume their active life; this point once dying, all dies."

Throwing out of immediate consideration the idiosyncrasies, let us for a few moments consider the question of the general safe exhibition of the agent.

The safest agent may be made a source of ill: as the intruder on the physical laws of his organism must suffer the consequences of his ignorance or temerity, so may an agent be made an injury by its abuse. As the imbibition of alcoholic beverages may be carried to a point beyond which the life principle reacts not, just so, and as the warmest supporters of the anæsthetics would have impressed, may ether be made an instrument of irreparable injury, blasting and destroying where it was designed to refresh and save.

To describe or lay down certain reliable rules, applicable in all cases, of the process of etherization, is an impossibility. The presentments of conditions in various individuals so materially differ, that any but rules, the result of a general knowledge of the agent, a comprehension of physiological laws and pathological alternations, were charlatanism to act upon. One person, as Dr. Snow

remarks, "shall become impassable as the subject on the dissecting-table; another talks incoherently or mirthfully, replies to questions, or obeys directions; others utter exclamations of pain, which they afterward retain no reminiscence of having felt; and others again declare that they have suffered pain but felt themselves powerless for its expression. Finally, in not a few, ungovernable, violent or convulsive action takes place, quite adverse to the performance of any delicate surgical operation. With some an utter oblivion is induced; while others, while undergoing all the apparent torture of a prolonged dissection, are reveling in the realms of memory and in the fields of imagination." M. Jobart and other observers have attempted to lay down three distinct stages in its effects, according to the prolongation of the etherization. 1. That of incoherence, agitation, or delirium, as the case may be. 2. Acceleration of the pulse, with loss of sensibility and loss of power. 3. Exhaustion and coldness of the surface. As we remarked, the matter cannot thus be methodically laid down, for it is quite certain that any of these conditions may be induced, in different individuals, by very various doses of ether; while others, again, are susceptible of only the first degrees, to appearances, and yet enjoy an immunity from suffering during operations. Even the quickened condition of the pulse and respiration, and that almost universally employed criterion, the stationary condition of the pupil, may all deceive in the supposed impression produced.

Various of the French Academicians some years back instituted a series of experiments upon animals, for the purpose of determining the mode and order in which the various portions of the cerebro-spinal system were influenced during inhalation. The following are some of the conclusions arrived at by the veteran vivisector, Baron Flourens:

"The action of ether upon the nervous centers follows in a given course. It acts, first, upon the cerebral lobes, disturbing the intellect. It acts, secondly, upon the cerebellum, deranging the equilibrium of the movements of the animal. Thirdly, it acts upon the medulla spinalis, in which it extinguishes, successively, the sensory and motive principles; and, lastly, it acts upon the medulla oblongata, where arrived, life becomes extinct."

To produce the best effects of sulphuric ether, it is of the first consequence that an entirely reliable article be employed. "For myself," says Dr. Robinson, of London, "I feel convinced that many of the failures that have occurred in its administration in some

measure may be attributed to the imperfect preparation of the fluid. I have myself obtained ether of various specific qualities from different chemists; and on one occasion, requiring an extra quality for a series of experiments, the gentleman supplying, being out of that quality he had generally furnished, sent some of a different kind which he had in his establishment, which was administered in two cases. I found, however, I could only produce partial unconsciousness, not insensibility to pain, and therefore deferred the operations, which were upon the teeth. I afterward procured some of the first quality ether, and employed it in the same case with success."

The effect of a bad article of ether is not only the inability on the part of the operator to produce more than a partial unconsciousness, but it is almost certain to produce nausea, giddiness, and prostration. If a good article cannot be procured, better use none at all.

The quantity of ether that may be given to an individual patient is a matter for the practitioner to decide upon in connection with each case. It is impossible to fix the dose of vapor that will be required to produce given effects upon any patient, neither is it always an easy matter to decide when just enough has been administered. We cannot rely implicitly on the state of the pupil or pulse, or upon what is considered by so many as the exact indication, namely, the insusceptibility of the eyelids to impressions made by striking the hairs. Perhaps the changes in the breathing are the most reliable signs: these certainly influence me most; so long as breathing continues easy and natural, little danger is to be anticipated, but the moment it becomes labored, one is to precede or recede cautiously. In etherizing a patient let the operator watch the pulse, the expression, and the respiration. So long as these give no counter-indications, the exhibition may be carried forward to the end desired.

As to a question of the continuance of a patient in the anæsthetic condition, I think it will be found the proper rule to make the time just as short as possible; that is to say, as the continuance of the exhibition of the agent is concerned. If an operation to be performed in the anæsthetic condition may be completed in five, ten, or fifteen minutes, it is not good policy to prolong it, and with it the continued administration of the ether to a half or a full hour. That there is, however, any imperative or absolute necessity to hurry through an ether case is not at all implied. I have known a patient kept continuously under ether for forty-two hours; and in obstetrical

practice, ten or twelve hours of anæsthesia is not at all unfrequent. I only contend that it is neither necessary nor prudent to prolong, without object, the condition. Where, however, such a prolonged action is demanded, it is to be secured, not by keeping the saturated sponge constantly applied over the air-passages, but only at such intervening periods as is necessary to preserve the anæsthesia.

The condition of the temperature, as might be inferred, has much to do in prolonging or shortening the time commonly considered necessary to place a patient in a state of sleep. Dr. Snow procured, from experiments, the following results:

One hundred cubic inches of air, saturated with the vapor of ether, at a temperature of

44°	would contain	27	cubic inches of	vapor.
54	"	24·3	"	"
64	"	43·3	"	"
74	"	53·6	"	"
84	"	66·6	"	"

Being doubled by a rise of only thirty degrees; or in other words, we perceive that if, at a temperature of 84° Fahrenheit, we employed two, or two and a half minutes in affecting a person to the state desired, at a temperature thirty degrees less we would require from four and a half to six minutes to have the same result.

Concerning the idiosyncrasies, I would speak my own experience by saying that I have never yet met with a person who I thought might not take ether, or ether in combination with chloroform. The London *Medical Gazette* considers its use inadmissible where there is a tendency to apoplexy, epilepsy, and also in plethoric individuals. Another intelligent source says that persons presenting the slightest signs of being cataleptic should be viewed as idiocratical. Persons while under the influence of liquor, it is generally esteemed, should be viewed for the time as not fit subjects.

In a conversation with Dr. J. B. F. Flagg, had several years back, that experienced man told me he believed in no idiosyncrasies, except it might be a very high, nervous temperament; remarked that he had administered ether to the infant of thirty-six hours and to persons in extreme old age; had given it to the robust and the weak, the plethoric and the consumptive; had used it in all states of pregnancy, except that stage known as quickening; would also exhibit it here, but would feel called on to exercise more than ordinary care. Seeming idiosyncrasies might generally, he thought, be explained by an examination of the operator's ignorance of the

agent. The faith of this gentleman in the perfect safety of the use of ether is so great that he remarked he would not hesitate to use it where there had been, or was, aneurism of the aorta. The opinion of Dr. Flagg concerning the non-existence of idiosyncrasies is to be taken before that of most persons either of this country or Europe. His opportunities for observation have not been surpassed by those of any other person, and perhaps equaled by few. The work published by him in 1854, long before his retirement from practice, has not, up to the present day, been advanced on, and is an heirloom to be valued by those to whom his industry has left it.

CHAPTER XVI.

GENERAL ANÆSTHESIA.

From the consideration of sulphuric ether we may pass to an investigation of the character and merits of the perchloride of formyle, or chloroform. This agent is, without any doubt, the most powerful and reliable of the anæsthetics; but, unfortunately, it possesses qualities which render it not unfrequently fatal to life, and therefore make it of less value than the one we have been just considering. No person should employ chloroform who is not prepared to meet many emergencies.

To procure chloroform, the chemist takes of chlorinated lime say (to take a common formula), lbsiv; rectified spirits, Oss; water, Ox; chloride of calcium, broken in pieces, ℥j. Put the lime, first mixed with water, into a retort, and add the spirits, so that the mixture may fill only the third part of the retort. Then heat them in a sand-bath, and as soon as ebullition begins withdraw the heat as quickly as possible, lest the retort should be broken by the sudden increase of heat. Let the liquor distill into the receiver so long as there is nothing which subsides, the heat being reapplied, if necessary. To the distilled liquid add a quarter of the water, and shake them all well together. Carefully separate the heavier portion, which subsides, and add the chloride to it, and frequently shake them for an hour. Lastly, let the liquid distill again from a glass retort into a glass receiver.

In appearance chloroform resembles the freshest water of the mountain-spring; to the taste it is hot and very sweet; to the nostril it has much the odor of the common strawberry. When dropped upon linen it evaporates most quickly, leaving, if pure, no stain or sign behind. In weight it is quite one-half heavier than water, and, as its vapor is concerned, is four times heavier than atmospheric air.

The smell of chloroform, says Dr. Snow, should be esteemed one of the best tests of its purity and identity. When dropped on the hand it should quickly evaporate, leaving not the least smell or

moisture behind. If a disagreeable odor remains on the hand after the evaporation, the chloroform has probably been made from impure spirits, or even from wood or acetone, and is therefore unfit for medicinal purposes. When chloroform becomes decomposed from any cause, it acquires a greenish-yellow color, and gives off chlorine and hydrochloric acid, so that the alteration is at once apparent. When chloroform is pure, it has no reaction on test paper, but is quite neutral. The best way, according to Dr. Snow, to detect a small quantity of hydrochloric acid in it, is to moisten a slip of blue litmus paper with distilled water, and hold it just within the neck of the bottle exposed to the vapor. If sulphuric acid should be present, it may be discovered by agitating the chloroform with distilled water and adding nitrate of baryta.

Chloroform may be degraded by admixture with alcohol, and this can be done without making any perceptible change in its appearance: its specific gravity, however, is thereby lowered; and, according to M. Mialhe, the foreign presence is most simply detected by adding to the suspected fluid a small quantity of water, when a milky opacity results.

Chloroform, as the heart's action is concerned, is a powerful sedative. In nearly if not quite all the fatal cases resulting from the administration of this agent, cardiac syncope has been the cause of death; and in a very small minority of the cases indeed has there been any evident interference with the process of respiration. This fact is always to be held in strictest remembrance when exhibiting the agent.

In oral surgery, where it is desirable to produce the profoundest and most prolonged primary impression, chloroform, if it were without danger, is the anæsthetic most indicated and required. Indeed, in my own practice I find many cases where I do not seem to be able to get along without it, either using it alone or in association with the ether. Because its use is therefore so frequently necessary, the oral surgeon should make himself as familiar as possible with all that concerns its defects as well as its virtues.

Experiments have demonstrated that eighteen minims of chloroform is the average quantity necessary to put an adult in a condition insensible to surgical operations,—that is to say, that this amount should be absorbed and carried to the nerve centers.

It has also been shown "that chloroform vapor has the effect of suddenly arresting the action of the heart, when it is mixed with the respired air to the extent of eight or ten per cent. or upward." With

these two lessons appreciated, it is seen that the manner and character of the exhibition of the agent have much to do with the result. Not everything, however, as it is too truly a fact that fatal accidents have occurred in the best and most skillful of hands, although in these latter cases, the inference is to be drawn that the deaths occurred from idiosyncrasies.

Eighteen minims, according to Dr. Snow, are to be absorbed from thirty-six breathed; allowing thus that one-half is lost in expiration. But temperature, as in the case of the ether, has much to do with the taking up of such a quantity. The following table comprises the experiments of Dr. Snow in this direction. At a temperature of 40° Fahrenheit, 100 cubic inches of air will take up but seven cubic inches of the vapor.

At 45°	8	cubic inches,	At 70°	24	cubic inches.
50	9	"	75	29	"
55	11	"	80	36	"
60	14	"	85	44	"
65	19	"	90	55	"

This table readily exhibits the fact that anæsthesia, by the use of chloroform, must come on at varying periods, and that therefore no judgment of its proper exhibition is to be derived in this direction. Again, outside of these atmospheric associations, the manner of the exhibition would have much to do with the minims inspired: where, for example, it is exhibited poured over a single layer of linen (as upon a handkerchief laid over the face), quite as much would be lost in the surrounding atmosphere as would be inhaled into the lungs.

Considering the danger as arising from the direction of cardiac syncope, advantage is to be taken of all conditions antagonistic to such depression. In blood-letting, it is known that such a condition is much the most readily brought about when the operation is performed on the patient standing, and when the primary impression is made most marked through a large exit for the blood. In states of depression, arising from whatever cause, either of physical or mental disturbance, such tendency is increased. A surgeon always hesitates to bleed a depressed patient; or, if such bleeding seems a necessity, supporting means are employed and continued in conjunction with the blood-letting. Advantage is taken also of all collateral indications, as for example, position, the patient lying down, the head perhaps being placed on a lower plane than the body, the

orifice of exit being made very small; intermissions in the flow of the blood, stimulants, as the pre-exhibition of brandy or wine, kind and encouraging assurances, etc. The depressing effect of fear on the heart's action is never to be lost sight of in the administration of chloroform. How many patients faint even while preliminary arrangements in anticipation of an operation are going forward; and, indeed, how many are the cases on record of death from such fright! It would seem, then, that one would never be justified in administering chloroform to a patient laboring under any marked depression, at least such is my own conviction, and upon such conviction I have always acted. All persons, or nearly all, approach an operation with a certain amount of trepidation, but such fear may, in the majority of cases, be dispersed; or if this is impossible, then a preliminary artificial courage may be given by the use of brandy, or cerebral consciousness may be disturbed by the inhalation of a few drachms of ether.

The objection, that chloroform should not be administered to a patient in a sitting position, does not, however, seem to hold entirely good. In oral surgery this is nearly always the necessary position; and I have thus administered it, in perhaps hundreds of cases, without ever having had any ill result. A difference in the character of cardiac syncope is here to be recognized. The paralysis may arise from two sources, and exhibit, as far as the state of the heart is concerned, quite different appearances,—that is, there is a syncope of anæmia and a syncope of narcotism. Now while there are between these two conditions much relationship, as the question of a vital propulsive force is concerned, yet there are as well certain differences, of which, as surgeons, we may take advantage. Paralysis of the heart occurs when, from any reason, the organ is deprived of the effect of its natural stimulus, the blood: this is the syncope or paralysis of anæmia. It occurs again when, through the action of a common or specific narcotic, its muscular fibers are relaxed and deadened. The two causes may exist, and may act in conjunction. Chloroform is a specific narcotic, as the heart is concerned; at least this would seem to be the deduction from post-mortems made in the fatal cases of its exhibition. In anæmia, syncope is partly a mechanical production; the patient, in a standing position, faints, as the result of gravity counterbalancing the natural distribution of the blood. In narcotic syncope position is, perhaps, of little consequence, as far at least as the action of the producing cause is, of itself, concerned. The question then of sitting or lying, as the exhibition is concerned, resolves

itself into a consideration of the state of the general health of a patient: if there is deficiency, either in quality or amount of the vital fluid, then the erect, or even semi-erect position, should never obtain. If, on the contrary, a patient does not present such conditions, then it would seem there is no special danger in such position.

Prefatory stimulation, if not contraindicated, is happily employed in conjunction with chloroform. A tablespoonful or more of brandy given to a patient some five or ten minutes before the exhibition of chloroform, will frequently support the natural action of the heart through a prolonged operation, and thus dismiss the common source of alarm.

In my own practice I never use chloroform but in conjunction with ether—not mixing them, as in the common chloric ether, but alternating, as the case seems to require or allow. Thus, employing the cone of sponge, I commence the process by pouring within it a quantity of ether, which is gradually, and yet as rapidly as possible, brought to cover the mouth and nostrils. If now I find the pulse rapidly increasing, or even remaining fixed and steady, and particularly if undue cerebral excitability manifests itself, I drop into the cone ten or twenty drops of chloroform; this will generally be found to almost instantly quiet the patient—from this point I proceed, using principally the chloroform or ether, according to the result to be secured. If an operation is one of simple character and of quick performance, as the extraction of teeth, or the making of some simple puncture or incision, then I think we had better not risk anything with chloroform. If, on the contrary, it is some difficult and tedious case about the mouth, where, after commencing, the surgeon cannot well stop to readminister the anæsthetic, then I take the risk of the excess of chloroform for the prolonged effect it yields and the greater profundity of the impression it secures.

The manner of the exhibition of the agent would have, as one would infer, much influence, as the result is concerned. Thus, of the various apparatus that have from time to time been devised to assist in the use of chloroform, many are deserving of no better name than life-traps; and in this connection one naturally finds himself wondering at the character of contrivances which, particularly in the earlier history of chloroform, were employed, even by the ablest men, in experiments directed to the testing of the general safety and results of the agent. I can never read of the white mice, and of the guinea-pigs, and cats, and bell-jars of these experiments, without wondering that it should never have seemed

to strike them that animals might as well die from lack of proper respirable air as from chloroform.

In using pure chloroform, it is most desirable that there should be the fullest admixture with air; with this intention we use the sponge, first softening it with warm water, which water is to be well squeezed away. The respiration should be easy and natural, and the patient fully *en rapport* with the operator. He should be given to understand that anæsthesia is but a gentle and harmless sleep, and that one should enter upon such a condition as he enters upon natural slumber; if such confidence can be secured, there will not be found much trouble in producing narcotism. Another plan of using the agent, and which has many advocates, is to let fall drop after drop upon a napkin, laid loosely over the air-passages.

However employed, the principal indication is to have it in proper dilution and combination with atmospheric air; this secured, any mode of inhalation must be a proper one. Insensibility, as remarked by Dr. Snow, is not caused so much by giving a dose as by performing a process. Nature, continues this gentleman, supplies but one mixture of diluted oxygen, from which each creature draws as much as it requires; and so, in causing narcotism by inhalation, if a proper mixture of vapor and air is supplied, each patient will gradually inhale the requisite quantity of the former to cause insensibility, according to his size and strength. It is desirable to vary the proportions of vapor and air, but rather according to the purpose one has in view, whether medicinal, obstetric, or surgical, than on account of the age or strength of the patient; for the respiratory process bears such a relation to the latter circumstances as to cause each person to draw his own proper dose from a similar atmosphere in a suitable time.

The induction of insensibility varies with the individual, or rather, one might better say, with classes of individuals. One class will breathe quietly and slowly, until unconsciousness supervenes as if by a natural sleep; this belongs to the lymphatic temperament. The nervo-sanguine or bilious class are apt to become restive and frightened, and require a great amount of care and attention, being the most difficult to impress. The true and full nervous class, while timid and frightened, are apt to be impressed by a very few inhalations. There is one question that here arises in regard to the exhibition of timidity. When a patient becomes restive and excited, shall the chloroformization go on? Yes, I would answer, if such exhibition is associated with mental disturbance produced by the

chloroform, for here it is not as the condition previously named, but is rather an hallucination. These patients should be forced rapidly beyond such states of excitement, and here is the point in which the production of anæsthesia demands the greatest skill, courage, and judgment. I have over and again seen incompetent operators worry a poor creature into a most wretched condition simply by fearing to pass the Rubicon of excitement. If assured that all is right, and such assurance is to be derived from the general aspect of the patient rather than from any special signs, we are to get over this intermediate excitable stage as quickly as possible, and get over it by concentrating the chloroform. Patients laboring under this excitability will, often enough, assure you that they feel that another inhalation will kill them; that it is impossible to breathe; that the heart is laboring under a wonderful depression, and many complaints of like character. Such speeches are mostly to be taken *cum grano salis*,—the surgeon must judge for himself.

Before an operation of any magnitude is commenced, it becomes the surgeon to assure himself that his patient is in the proper anæsthetic condition. Entire paralysis of the muscles of animal life is commonly received as indicative of such a state,—this being manifested in the lifeless falling of an arm when raised. But this is not strictly reliable, as to obtund sensation we are aware the posterior root of the spinal cord is to be affected, while loss of motion implies only the anæsthesia of the anterior root. So quickly, however, does the action of the agent pass from the one to the other, that this sign is found to be one most convenient of acceptance. Dr. Snow, so far as I am aware, was the first to call attention to indications as afforded by the eyelashes; this test I have depended on for years, and mostly find reliable. Just after unconsciousness is induced, remarks this observer, the eyelashes are often closed very strongly when their margins are touched, especially in females, and there seems to be a positive hyperæsthesia; this, however, is only apparent, and arises from the control of the will being removed while sensibility remains. By continuing the chloroform the sensibility of the edges of the eyelids diminishes, until, at last, they may be touched without causing winking. Under these circumstances, the most severe operation may, in almost every case, be commenced without pain. Upon this indication of the eyelids, Dr. Snow thinks we may so entirely depend, as ordinary cases are concerned, as to accept from them information as to the exact extent of anæsthesia existing. When, for instance, he says, touching the margins of the lids causes very slight and lan-

guid winking, the patient will commonly flinch a little if the knife is used, but only in a manner that can be easily restrained, and will not interfere with the majority of operations.

Three degrees of narcotism are described. "The first degree includes all the effects of chloroform that exist while a patient retains a perfect consciousness of where he is and what is occurring. In the second degree there is no longer correct consciousness. The mental functions are impaired, but not necessarily suspended. In the third degree there are no longer any voluntary motions."

The circumstances which influence or modify the effects of chloroform are thus considered by Dr. Snow, than whom, perhaps, there is no one whose observations have been of a more extended or thorough nature; although it is not to be overlooked that he was so sanguine in this direction that perhaps, in some instances at least, his prejudices may have influenced somewhat his judgment.

"I arrived at the conclusion," says he, "after much careful observation, that chloroform might be given with safety and advantage in every case in which the patient requires, and is in a condition to undergo, a surgical operation. And having acted on this conclusion for several years, I have found no reason to change it. It is desirable, however, to pay attention to every circumstance connected with the health and constitution of the patient before exhibiting chloroform, as many of these circumstances influence its effects."

Age.—"The age of a patient has considerable influence in modifying the effects of chloroform. It acts very favorably on children. They sometimes oppose the inhalation of it as long as they are conscious, but it does not occasion the rigidity and struggling, after loss of unconsciousness, which are sometimes met with in the adult. Anæsthesia is generally induced with a less amount of narcotism of the nervous centers in children than in grown persons.

"The effects of chloroform are more quickly produced, and also subside more quickly in children than in adults, owing, no doubt, to the quicker breathing and circulation. It often happens, however, that when the insensibility has been kept up for some time, say twenty minutes or half an hour, in a child, it is followed by a natural sleep of a few hours' duration, provided there is no painful wound or other cause to prevent the sleep. I have given chloroform, in a few cases, as early as the age of eight or ten days, and in a considerable number of cases before the age of two months. And I own memoranda of hundreds of cases under a year old to whom I have administered this agent. There has been no ill effect from it

either in these cases or in those of children more advanced in life; and it is worthy of remark, that none of the accidents from chloroform which have been recorded have occurred to young children."

There is nothing peculiar in the effect of chloroform upon people advanced in years except that its influence subsides rather slowly on account of the slower breathing and circulation. I have given chloroform to many patients over seventy-five years of age, and to one as old as ninety years.

Strength or Debility.—"The comparative strength or debility of the patient has considerable influence on the way in which chloroform acts. Usually the more feeble the patient is, whether from illness or any other cause, the more quietly does he become insensible; while if he is strong and robust, there is very likely to be mental excitement in the second degree, and rigidity of the muscles, and probably struggling in the third degree of narcotism. Patients in a state of debility resemble children, not only in coming quietly and easily under the influence of chloroform, but also in the circumstance, that the common sensibility is suspended with less narcotism of the nervous centers than is generally required in robust persons. Children, and persons in a state of debility, have usually an acute sensibility, which causes them to suffer pain from very slight injuries, but this sensibility is more easily suspended by chloroform than the less acute sensibility of robust persons."

Hysteria.—"Patients who are subject to hysteria sometimes have symptoms of the complaint, such as sobbing, crying, or laughing, as soon as consciousness is suspended, or even impaired, by the chloroform; but these symptoms can always be subdued by proceeding with the inhalation.*

"In some persons who are subject to hysteria the breathing becomes excessively deep and rapid while inhaling chloroform.† This

* Chloroform in hysteria is, I think, one of the most valuable medicines of the Materia Medica, while, on the contrary, sulphuric ether is, so far as my experience goes, most decidedly objectionable to such patients. I have treated females afflicted in this way where ether had been used by the pound with no other effect seemingly than increasing, intensifying, and prolonging the paroxysm; yet with a very few inhalations of chloroform, I have had the pleasure of seeing these persons fall into the most natural slumber, and after resting quietly for hours, the slumber prolonged, perhaps, as sometimes has seemed indicated, by occasional repetition of the inhalation, I have seen them, over and again, awake perfectly recovered.

† Dr. Snow, in his paragraph, remarks the supervening of this condition after the first few inhalations, but, according to my own experience, it is as

usually occurs just as the patient is becoming unconscious, but in a few cases even earlier, and the patient is aware of the impulse to breathe in this manner. After this kind of hysterical breathing has lasted a minute, the patient generally rests nearly a minute without breathing at all, after which the respiration becomes generally very natural. Chloroform is to be given very sparingly during the violent breathing, or else withdrawn altogether for a minute or two."

Pregnancy.—It is not generally esteemed that there is anything in this condition objectionable to the use of chloroform.

The Menstrual Period.—This period is certainly not to be preferred or selected as an occasion of chloroform exhibition. Yet is there nothing at all in the condition adverse to such exhibition. The controlling effect of the agent over hysterical symptoms has just been remarked, and such irritability of the system is the only peculiarity of this state. Indeed, it is very common that the hysterically inclined female is compelled to resort to chloroform, particularly in conditions of dysmenorrhœa.

Diseases of the Lungs.—"Affections of the lungs sometimes cause a little difficulty and delay in the administration of chloroform, as the vapor is liable to excite coughing when the mucous membrane of the air-passages is irritable. The inconvenience is, however, confined to the time of inhalation, for the cough is generally relieved afterward.*

"I have given," says Dr. Snow, "chloroform for surgical purposes in many cases where phthisis was present, and in several patients who had suffered from hæmoptysis, and have not seen any ill effects from its use in these cases. Chloroform has, indeed, often been inhaled with advantage to relieve the cough in consumption. The cases of chronic bronchitis in which chloroform is administered and for surgical operations are still more numerous."

Disease of the Heart.—"There is a very general impression that the use of chloroform is unsafe when disease of the heart

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uncommon when chloroform is used as it is common in the employment of ether. When, in administering ether, I see the slightest signs of hysteria, either in male or female, I always expect at once to control them by replacing the ether with chloroform.

* This difficulty, as observed not only by Dr. Snow, but alluded to by nearly all writers on anæsthesia, I have found to be almost, if indeed not entirely, obviated by preceding the exhibition with a tablespoonful of thick mucilage of gum acacia, the patient allowing it gradually to lose itself over the mucous surfaces.

exists, more particularly fatty degeneration of that organ. This belief has been encouraged by the circumstance that this affection has been present in a few of both the real and alleged deaths from chloroform, and also by the fact that, in the accidents that have been really due to chloroform, the heart has been the organ on which it has exerted its fatal influence. When we come to investigate these cases, however, we shall find reason to conclude that the heart has probably been diseased in quite as great a proportion of the patients who have taken chloroform without ill effects as those who have succumbed under its influence. As regards my own practice," says this authority, "the only case in which death could in any degree be attributed to the chloroform, was one in which there was extreme fatty degeneration of the heart; but, on the other hand, I have given chloroform in numerous cases without ill effect where the symptoms of this, as well as of other affections of the heart, were present in a marked degree. Indeed, I have never declined to give chloroform to a patient requiring a surgical operation, whatever might be his condition, as I early arrived at the conclusion that this agent, when carefully administered, causes less disturbance of the heart and circulation than does severe pain. Wherever," continues Dr. Snow, "I have had an opportunity of seeing an operation performed without chloroform, I have carefully examined the pulse, and although none of these operations have been of a very severe nature, I have found the circulation to be much more disturbed than it would have been by chloroform carefully administered. The pulse, in most of these cases, has been exceedingly frequent during the operation, and in some instances it has intermitted to an unusual extent.

"In one instance I had an opportunity of witnessing a similar operation on the same patient, first without chloroform, and afterward under the influence of the agent. In the operation, which was lithotrity, at the first operation I began to feel the pulse just when the patient saw the lithotrite about to be introduced. It was 120 in the minute. As soon as the instrument was introduced the pulse increased to 144, and immediately afterward it became uneven, irregular, and intermitting. I could not count more than three or four beats at a time; and, occasionally, when the pain seemed greatest, and the man was straining and holding his breath, the pulse was altogether absent for four or five seconds. In order to ascertain whether the absence of the pulse at the wrist might not depend on the pressure of the muscles of the arms, caused by grasping the

table, I applied my ear to the chest, and found that there was no sound whatever to be heard during the intervals when the pulse was imperceptible. It was evident that the patient held his breath till the right cavities of the heart became so distended as to stop the action of the organ till the respiration returned. The man did not complain or cry out during the operation.

"A week afterward the lithotrity was repeated, but on this occasion I administered chloroform. The pulse was 120 in the minute when the patient began to inhale the chloroform, but it became slower as he was made unconscious, and it was regular during the operation. It was only toward the end of the operation, when the effect of the agent was allowed to diminish, and when the man began to strain a little, though not yet conscious, that the pulse intermitted slightly, passing over a single beat occasionally. There were none of the long intermissions of the pulse observed on the former occasion.

"It is very evident that if the above-mentioned patient had been the subject of any affection of the heart which weakened or embarrassed its action, he would have run a much greater risk from the pain of the first operation than from the inhalation of the chloroform in the second one.

"In a few of the patients having the arcus senilis of the cornea, a weak, intermitting, or irregular pulse, and other signs of fatty degeneration of the heart, there have been a feeling of faintness and a tendency to syncope as the effects of the chloroform were subsiding, especially when the operation had been performed in the sitting position; but these symptoms have soon subsided, in all cases I have met with, on placing the patient horizontally, with, or without, the help of a little ammonia to the nostrils."

Cerebral Diseases.—"Affections of the head offer no obstacle to the administration of chloroform. I have given it to several patients who had suffered previously from an attack of apoplexy; some of them still retained the paralysis resulting from the attack, but the chloroform has not been attended or followed by ill effects in any of these cases."

The following interesting and most instructive case is mentioned in this direction.

"The 31st of October was a day appointed by Mr. Fergusson to perform lithotrity on a gentleman seventy-eight years of age, who had a phosphatic calculus in his bladder. He was a patient of Mr. Propert, and Mr. Fergusson had removed a similar calculus by litho-

trity, and I had given him chloroform at each of the operations, and it was arranged that he should have chloroform on the present occasion. Mr. Propert informed Mr. Fergusson and myself on our arrival that his patient had, the night before, an attack resembling apoplexy; he had been insensible; the breathing had been stertorous, the pupils dilated, and the face very red and congested. Mr. Propert had caused him to be cupped to fourteen ounces, and had given him twenty grains of calomel in the course of the night, and in the morning he was as usual, and remained so at the time of our visit. We considered the case with Mr. Propert, and as there were reasons for not postponing the operation, it was determined that he should inhale the chloroform rather than be subjected to the pain. The vapor acted very favorably, he recovered his consciousness a few minutes after the operation, and expressed himself as feeling quite well."

Insanity.—Chloroform acts on insane patients just as it does on others: when the effects subside they are in the same state of mind as before. Mr. Snow remarks the suspiciousness of the insane, but gives his experience where teeth have been extracted and other operations performed which it would have been impossible to accomplish in the same individual without resorting to inhalation. The employment of chloroform in the delirium of mania a potu has, through the experiments of Dr. Ely McClellan, of the United States Army, lately been revived, and commanded much attention, the successes of this gentleman having been quite sufficiently verified by practitioners in every part of the country: given in drachm doses, *pro re nata*, it seems completely to break the paroxysm, causing the patient to fall into profound sleep, from which, after eight or ten hours, he commonly awakes entirely relieved. In delirium, however, the chloroform is to be taken into the stomach, and not breathed.

I may close this consideration of chloroform by again remarking, as alluded to in the commencement of the chapter, that the agent, if one feels justified in using it, is far to be preferred in oral surgery to the ether—a profound impression created through chloroform will not unfrequently continue through quite a prolonged operation; or if it be necessary to renew the inhalation, the desired impression is generally made with great rapidity. Operations about the mouth, unlike most other surgical services, require to be executed with great rapidity; therefore is it a necessity to be as little interfered with as possible: an impression, apparently very profound, made

with ether, is apt to be broken in the very first shock of an oral operation. This first step may be of a character, starting, in some instances, frightful hemorrhage, and which can only be combated at the completion of the operation; to have a patient start from control at such a moment, and under such circumstances, is sometimes a matter of serious concern. If one has not used chloroform up to this time, and the article is at all convenient, it is very apt to be given to the patient in a quite free manner. I certainly do desire heartily to recommend it, but prefer, as my own practice is concerned, to combine it in varying proportions with sulphuric ether. I have, in this chapter, used, in many instances, the strong authoritative experiences of Dr. Snow. I believe, and think I know for truth, all that he maintains; his experience with the agent has certainly been of the most extensive nature, yet personally, however, I am as yet afraid to use chloroform but in conjunction with ether; and while such fear may not at all be well grounded, yet as it exists, I cannot do otherwise than give expression to it. At this day it is certainly idle enough to attempt to deny that many deaths have occurred in the use of chloroform, and these accidents have happened not alone in the hands of the charlatan, but the proportion of accidents have occurred with most eminent and skillful men, and where every care and scientific precaution possible were taken.

Again, the accidents have seldom or never been traceable to an overdose of the agent; the deaths have never occurred from narcotism, but from direct, immediate, and unforeseeable paralysis of the heart. I have not overlooked the fact, that fatal results happening while chloroform was being used, might not be at all owing to this agent. Certainly there are cases enough on record justifying such a conclusion — cases with which every surgeon must be familiar enough; but, on the other hand, there are, as well, instances in such doubt, or perhaps I should rather say, of such certainty, that one may rather err on the side of discretion.

NITROUS OXIDE GAS.

Except as its use in dental surgery proper is concerned, I do not think nitrous oxide will ever be found applicable to oral operations (at least, as we at present know how to get the effects of this agent). In this opinion, I am very well aware, others may not feel disposed to agree with me, and it may very well be that I am wrong, as I

have had little experience with the agent. Be this as it may, however, ether and chloroform appear so satisfactory, and every way reliable, and at the same time are so convenient of use compared with the gas, that I imagine they will continue to hold the supremacy.*

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* For a learned and exhaustive treatise on this subject, see a work by Dr. Geo. J. Ziegler. Also an able monograph by Dr. Geo. T. Barker, published in Philadelphia.

CHAPTER XVII.

SALIVARY FISTULE.

As a result of wounds, abscesses, ulcers, and other similar causes, it sometimes happens that external communication is established with the duct of Steno, in consequence of which the secretions of the parotid gland, instead of passing into the oral cavity, subserving their recremental purpose, are poured out over the cheek, irritating these parts, and proving the source of greatest discomfort, not unfrequently, indeed, locating quite intractable excoriations. In children, cancrum oris has frequently so sloughed away portions of the cheek as to produce the most intractable of fistulæ, necessitating, indeed, plastic operations for their cure.

An ordinary fistule is very well represented by the accompanying view.

FIG. 57.—SALIVARY FISTULE—FROM LIFE.

In this particular case,* the fistule was the result of abscess of the cheek, induced by caries of the tuberosity of the right superior maxilla; the history of the case being as follows: the

* Added to this figure, which is from life, is exhibited a second form, that of parotid fistule proper. The one cut has been made to subserve the two illustrations.

patient, a gentleman of most excellent constitution and easy circumstances, suffering from a carious wisdom tooth, had sought relief in its extraction. The dentist, however, to the misfortune of the patient, broke the tooth, and was unable to remove the fang. From the irritation thus induced, conjoined with that residing in the broken and inflamed root, a caries of the bone was induced; this, in its turn, inflaming the cheek, an abscess formed; this opened externally, involving the duct of Steno, thus producing fistule. The ordinary condition of the patient was as follows: the natural outlet of the gland continued patulous; consequently, to the comfort of the case, much of the secretion found its way into the mouth. Through the artificial channel enough, however, escaped to keep the cheek constantly bathed with saliva and pus, the orifice being constantly covered with a large but soft and pasty imperfect scab. Of course, so long as the saliva discharged through this channel, it was impossible for nature to close it.

In this case, three weeks, lacking three days, were required for the cure: first, examination was directed to the condition of the underlying parts. The caries of the bone being found cured, the depth and course of the fistule was discovered by the use of the ordinary silver probe. This, for three days, was enlarged by the introduction, each day, of a twisted tent of cotton. At the end of this period a slender, straight-bladed bistoury was passed directly through the cheek into the mouth. An eyed probe was next threaded with a cotton tent, large and thick at the part which was to occupy the inner half of the thickness of the cheek, delicate, and as threadlike as it could be made where it was to be lodged in the track of the fistule. By the aid of the probe this tent was carried through the cheek, and was then fixed in position by a little slip of adhesive plaster, attaching it to the cheek. This tent, being kept clean and disinfected by daily syringing, was retained in position one week, the swelling of the inner bulky portion having by this time resulted in the formation of quite a channel, with a corresponding diminution in the diameter of the fistule. At this stage the cotton was replaced with a wire seton, made by taking the most delicate of ligature iron wire, doubling it upon itself a number of times to half the thickness of the cheek, a single strand containing the length designed to occupy the line of the fistule. To replace the one with the other it was only necessary to attach them by an intermediate strand of silk: as one was withdrawn, the other occupied its place. This wire seton was thus inserted, and was held

in place by perforated shot clamped on each extremity. In one week the external or original fistule had closed so as to hug the wire, the discharge being entirely into the mouth. The seton was now withdrawn entirely, and on the next day complete closure was found to have resulted. The case was thus dismissed cured, and remained so.

A more common way to operate in salivary fistulæ is to take a strand of well-waxed ligature silk, threaded at each end to straight or curved needles, as preferred; seeking the bottom of the fistule, the first needle is thrust through the cheek into the vestibule and brought out at the mouth; the second needle is now passed to the bottom of the fistule precisely as the first, and is also thrust through into the mouth, but leaving some little tissue between its exit and the line of the first. The two ends being out of the mouth, a single knot is made, drawing it close up to the mucous surface of the cheek, strangulating the contained tissue. This strangulation, however, is not absolutely necessary, many surgeons, indeed, preferring the knot loose, and to have the new passage resultant simply from the presence of the silk. With such a new passage, the original fistule will mostly tend to heal of itself, particularly will this be found the case where the passage has been so made as to afford easier exit for the fluid than the fistule. It is on such account that my own experience prefers the operation first described.

Another form of salivary fistule, and one much more difficult to treat, is where, from operations performed over the parotid region, the gland has been exposed and some of its lobules opened. See Fig. 57.

To treat such a case, attempt may first be made to close the opening by means of a cauterant, either the actual or potential. Of the latter, the crystals of the chloride of zinc should, I think, have the preference, being markedly provocative of healthy granulations. Nitrate of silver has been used by many with reported good success. Cauterization, however, we are compelled to admit, is much more frequently unsuccessful than otherwise, the more philosophical and effectual mechanical measures being required.

A mode of operation, not unlikely to meet with success, consists in the use of the strands of wire, made and employed precisely as suggested in the more simple cases.

It has been recommended by many surgeons that in cases of fistulæ with induration of the part, such tissue be punched or cut out: this was a favorite mode with the late Professor Horner. To

accomplish this end, a blade or spatula of wood is placed against the inside of the cheek, thus supporting it; a slight longitudinal incision is now made on the outside, through which the punch is passed, cutting the section from the inside half of the thickness; the external wound is next approximated with a few stitches of the interrupted suture, and if union should be secured, the cure will be found complete. In this connection, too much praise cannot be given to applications of alum-water, alternated, if it is thought desirable, with very dilute tincture of capsicum. With these applications, I am certain that I have secured union in cases which, without them, would have been utter failures. Upon Plate VI., taken from Professor Smith's Principles and Practice of Surgery, Figs. 1, 2, and 3, the surgical relations of fistulæ are exhibited; also Horner's operation.

PLATE VI.

A VIEW OF THE ANATOMY OF THE SIDE OF THE FACE, AND OF SOME OF THE OPERATIONS PRACTICED ON IT.

FIG. 1.—A side view of the Anatomy of the Face after the removal of the integuments. 1. The shape and position of the parotid gland. 2. The duct of Steno. 3. The sublingual gland. 4. The facial artery, at the point where it passes on to the face. 5. The facial vein. 6. The sterno-cleido-mastoid muscle. 7. The external jugular vein. 8. The zygomatic muscle. 9. Branches of the portio dura nerve emerging from the upper edge of the parotid; other branches are seen on the face.—*After Bernard and Huette.*

FIG. 2.—The same Section after the removal of the Parotid Gland. 1. The portio dura nerve at its exit from the stylo-mastoid foramen. 2. The duct of Steno divided transversely. 3. The external carotid artery when freed from the parotid. 4. The temporal artery. 5. The facial artery after removal of the sublingual gland. 6. The sterno-cleido muscle. 7. Main trunk of the external jugular vein.—*After Bernard and Huette.*

FIG. 3.—A three-quarter view of Horner's operation for the cure of Salivary Fistula. A wooden spatula supports the inside of the cheek; a slight longitudinal incision is made at the external fistulous orifice, and the hand of the surgeon is seen pressing the punch against the spatula so as to cut out a piece through the cheek. The external incision, being closed by a point of a suture, heals usually by the first intention, leaving the orifice, made by the punch, open in the mouth.—*Drawn from Nature.*

FIG. 4.—A view of the operation of Resection of the Upper Jaw, as practiced by the incision of Warren. 1, 2, 3. The flaps everted, and turned over the nose and eye so as to expose the bone. The left hand of the surgeon is holding, 4, the bone at the moment of disarticulation by the knife, 5, which is working at the pterygo-maxillary fissure. Velpeau's operation is nearly the same as that of Warren.—*After Bernard and Huette.*

FIG. 5.—Represents the completion of the operation, the union of the wound by the twisted suture, and the line of the cicatrix, which extends from the malar bone to the mouth near, but not at, the angle.—*After Bernard and Huette.*

FIG. 6.—A view of the termination of Gensoul's operation, showing the lines of his incision. 1, 2. The first incision across the tumor. 3, 4. The second incision. 1, 5. The third incision, forming flaps which are to be turned up and down upon the face. The sutures are seen as placed at the termination of the operation.—*After Gensoul.*

NOTE.—Figs. 4, 5, and 6 refer to operations considered in another connection.

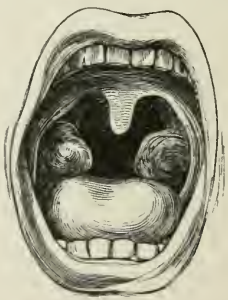
CHAPTER XVIII.

THE TONSIL GLANDS.

The tonsil glands, situated on either side of the fauces, between the half arches, are readily exposed by depressing the tongue through the instrumentality of any convenient means. An instrument made especially for the purpose, called a "depressor," will be found very well adapted.

The tonsils, glandular organs, are made up of many lobules, with intervening sulci lined by involutions of the common mucous membrane. Inflammation, simple or acute, and chronic or morbid, is the disease of these glands. With the first are associated the various features of vascular change, passing from the most transient of congestions to the most threatening of abscesses.

Fig. 58.—The Tonsil Glands.



Simple tonsillitis—angina tonsillaris—amygdalitis—is an inflammation of the substance of the gland. Looking into the mouth, the bodies, one or both, are discovered unduly colored and swollen; if the inflammation is of any severity in its grade, the patient experiences pain and difficulty in swallowing, a sense of dryness, heat, and fever in the fauces; and these discomforts, influenced by the character of the attack, may progress until it becomes impossible to swallow, and in many cases exceedingly difficult to breathe.

Glancing at the view, which exhibits the glands in a state of partial enlargement, it is plainly enough seen that the isthmus would be closed in proportion to such enlargement; hence the difficulty experienced in deglutition and respiration. Tonsillitis ends either in resolution or suppuration.

When the inflammation is met with in its incipiency, attempts are at once to be made to resolve it by the use of antiphlogistic remedies,—free scarification has occasionally been resorted to with the best results. Leeches externally, and blisters, will be found of the greatest service, hot foot baths, etc. If the inflammation should have advanced to a point in which the system at large sympathizes, as exhibited by the presence of fever, hope is still to be entertained of recovery by resolution. In these cases I have found it good practice to place the patient over a basin of steaming water, and with the form enveloped up to the very mouth in blankets, secure diaphoresis by a plentiful exhibition of the spiritus Mindereri—a tablespoonful every 10 to 15 minutes until the result desired is produced. This, if the patient is robust, may be succeeded by a saline cathartic. As a local treatment, it will be found very agreeable to order a lemonade, made by crushing ice in a towel or napkin; the small particles of the ice thus acidulated may be taken little by little into the mouth, and allowed gradually to dissolve. Another application consists in a gargle of flaxseed tea, in which is dissolved the chlorate of potash. Tartar emetic, or the tinct. of digitalis, or of verat. viridum, are of much use in controlling the circulation. A very useful combination, where the circulation runs high and the system is irritable, is as follows:

℞.—Liq. potass. citrat. ℥iij;
Spts. æth. nit. ℥i;
Tinct. verat. virid. gtt. xxv;
Ant. et potass. tart. gr. i. M.
Sig. From ℥i to ℥ss, according to circumstances.

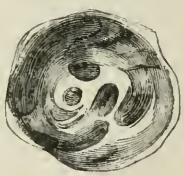
In most cases of tonsillitis where the inflammation is extensive, the uvula will be found to participate; swelling, through serous effusions occurring, not unfrequently to such an extent as to threaten a very immediate suffocation. I know of nothing more satisfactory in these cases than the draining of the cellular tissue in which the effusion exists by snipping off with a pair of scissors the tip of the organ. In the swelling of the glands themselves, where danger is apprehended from the closure of the passage, or overpressure upon

the epiglottis, it is well to make free incisions, or these failing, to amputate a part of one or both bodies. Indeed, circumstances may arise where an opening into the larynx or trachea may afford the only chance to a patient for his life.

Where, in defiance of all treatment, tonsillitis determines toward suppuration, the best that can be done is to hasten the process as rapidly as possible, providing, always, that the attendant swelling is not formidably extensive. In these latter cases nothing better can be done than to make premature incisions. Where the swelling is not extensive or threatening, gargles of flaxseed tea will be found both soothing and encouraging to the formation of pus, and may be used with all freedom.

Hypertrophy, or chronic enlargement of the tonsils, is a condition most common to scrofulous children, and pertains, consequently, to early life, being, indeed, very rare after puberty, and never perhaps seen in old age; of the various patients upon whom I have operated for the relief of this affection, I do not recall one over thirteen years of age. An enlarged or hypertrophied tonsil differs very much in its consistence and character, being in one patient indurated and smooth, in another spongy and lobulated. In color an equal variety is presented, varying in appearance from the scarlet of an arterial injection to the dull blue of a passive venous stagnation. One of the inconveniences associated with enlarged tonsils is the effort required in respiration, particularly during sleep, such effort in many cases, being really painful to witness. Another, is the interference with hearing, pressure upon the Eustachian tube frequently occluding this passage, particularly when the patient takes cold.

Fig. 59.—Hypertrophied Tonsil.



Tonsillar hypertrophy being a systemic expression rather than a strictly local disease, very little true benefit has been derived from the employment of the great variety of direct remedies which from time to time have been recommended. A patient so afflicted is to be treated from the constitutional stand-point, and to this end no-

thing in my experience has been more conducive to change than cold salt-water bathing; indeed, I apprehend that, as a rule, more attention will be found required to the direction of diet, clothing, exercise, and general mode of life than to the administration of medicine. Where, however, medication seems demanded, it is to be directed to the correction of any observable constitutional defect or irregularity. Iodine and its preparations are not always, by any means, indicated; and not unfrequently, in their exhibition, by a further debasement of the vital powers, much more harm than good has resulted. It does not seem possible to lay down rules that shall or can apply to the constitutional treatment of such cases, except so far as to suggest attention to all the functions and the general tonic medication always demanded.

Pressure by the finger, frequently repeated, punctures with the point of a bistoury, the application of any of the scorbifacients, very dilute gargles of the tincture of capsicum,—any or all these means may have local trial; but it is to be regretted that the promise is very little.

The local employment of the iodide of zinc has, in Europe, received very warm commendations. It is used first as a strong solution, from ten to thirty grains to the ounce—afterward pure, or as it deliquesces when exposed to the atmosphere.

An enlarged tonsil, truly hypertrophied, is best removed by making a section of it. To this end the instrument known as the tonsillotome is always to be recommended; of such various instruments, that known as Fahnstock's is perhaps the best. With this, the section can be made in a single moment, and in hands at all accustomed to operate, without the slightest risk.

In operations upon young children, with the tonsillotome, it will be found best to employ ether, as otherwise the restlessness may interfere with the proper introduction of the instrument. After excising one tonsil the child should have its head immediately thrown forward, that the blood may not pass into the throat. As soon as hemorrhage has stopped, the ether is to be readministered, and the section repeated upon the opposite side.

To accomplish this operation with delicacy, it is only necessary to place one's self before the patient, whose head is supported against the breast of an assistant; the tongue-holder may or may not be employed, as seems most convenient. In cases where the gland may be larger than permits the easy application of the instrument, it will be found very useful to use a hook, or the double hook forceps,

pulling the body into the fenestrum. This accomplished, it is only necessary to slide the catch-pin. When the gland is thus fixed, the blade is instantly made to incise it.

Many surgeons, immediately after this operation, and in many instances before it, administer, in anticipation of inflammatory trouble, a full dose of sulphate of magnesia. It is also thought well by many to protect the incised parts against the irritating influence of atmospheric changes by a confinement of several days in an even temperature. I think, however, that if the weather is moderately mild, it may be found sufficient to keep the parts lubricated by a coating of gum acacia, secured, by simply holding the pearls in the mouth until they dissolve; at least, such practice has proven very satisfactory in my hands.

Hemorrhage, of any marked character, after the operation, is not common: instances occur, however, when the tonsillar artery must be compressed, twisted, or tied; but, as a rule, there is no trouble from this source that a simple gargle of alum-water will not be quite sufficient to overcome.

Ulceration.—Ulcers, both common and specific, are frequently met with upon the tonsils. Nothing peculiar in their history associates itself with the situation; they are to be treated in consideration of their varying indications. (See *Remarks on Ulcers.*)

Gangrene.—This is an occasional, though very rare condition; when appearing independent of exanthematous relations, it is to be looked on as indicative of great prostration in the life forces, and must be expected to yield alone to vigorous constitutional treatment. As local applications, Watson's chlorinated water, solutions of carbolic acid, or starch-water and creasote may be used.

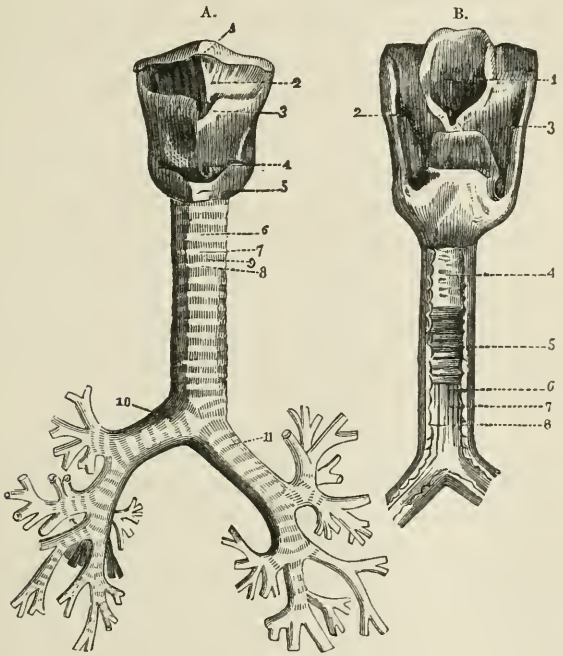
Cystic Growths.—In Professor Gross's System of Surgery reference is made to cystiform enlargements which have been observed in the tonsils; with such conditions I have never happened to meet. The treatment, however, would necessarily be simple, and would be entirely analogous to that of ranula, which see.

Acute tonsillar enlargement sometimes compels the performance of laryngotomy or tracheotomy. A passing study of these operations would thus seem made a part of our subject.

When convinced that a patient may not otherwise be relieved, and suffocation is eminent, the surgeon may thrust a bistoury or scalpel directly through the crico-thyroid membrane. This operation, if no middle thyroid artery run over the membrane, is one of most simple character; and if the parts be then separated, and kept so, either by

the introduction of a tube, or by hooks of wire, which may pass around the neck, the patient will experience the greatest relief. When the artery crosses the membrane, and has thus been cut, the blood is to be prevented from entering the lungs by leaning the person forward, the face downward; the vessel is then to be secured in the most convenient manner, with ligature, if possible.

FIG. 60.—VIEW OF THE AIR-TUBES.



A. Larynx, trachea, and bronchial tubes, viewed in front. 1, hyoid bone; 2, thyro-hyoid membrane; 3, thyroid cartilage; 4, crico-thyroid membrane; 5, cricoid cartilage; 6, trachea; 7, 8, two cartilaginous rings; 9, membrane which separates them; 10, right bronchus and its divisions; 11, left bronchus.

B. Larynx, trachea, and commencement of bronchial tubes, viewed from behind. 1, upper opening of larynx; 2, 3, lateral grooves of larynx; 4, fibrous membrane of trachea, interspersed with small glands, beneath which are seen 5, muscular fibers; beneath this last are 6, 7, small fibrous bands; 8, mucous membrane seen between them.

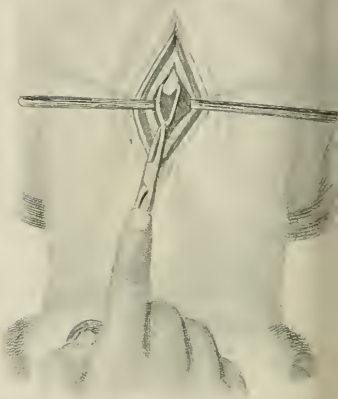
Tracheotomy is an operation which, while seemingly complex, is yet most easy of accomplishment, at least I have found myself able to perform it upon the living subject without assistance. Having the patient upon his back, with the neck extended, an incision is to be made directly in the middle line of the neck; this incision,

under the circumstances we are considering, may be quite short, and is to be commenced immediately below the cricoid cartilage. Dividing skin, superficial fascia, and the delicate layer of the deep fascia, we come upon the equilateral muscles running from the sternum to the os hyoides and thyroid cartilage; seeking the interspace separating these muscles, they are thrust to either side,—this is easily done by using the handle of the knife,—the thyroid plexus of veins is now brought into view, and is to be carried aside or ligated, as seems most convenient; these manipulations bring into view the trachea with its rings. Take now the tenaculum, and, steadying the tube by pulling it upward, incise one, two, or three rings.

The operation thus accomplished, keep the incision open by the use of the wire, or, if preferred, introduce the canula and maintain it in place by the strap, as seen in Subfig. 6, Plate VII.

In performing the operation, it is also necessary to bear in mind that occasionally the inferior thyroid artery is found lying upon the trachea, directly in its middle line. When this vessel is seen it becomes necessary to throw a ligature around it. My own observations in the dissecting-room would lead me to infer its presence in this position in about one out of six cases.

Œdema of the glottis, a condition sometimes associated with acute tonsillitis, is a very dangerous complication, being found generally in the weak and anæmic. This complication, when really threatening, may be aborted by blistering the neck with cantharidal collodion, and afterward keeping up the watery discharge by painting the parts with glycerin. If, however, such a treatment is not quickly responded to, the surgeon finds himself compelled to scarify the parts. Subfig. 8 represents this swollen condition of the glottis. To scarify these parts, seat the patient upon a chair, and, throwing the head well backward, introduce the finger until it shall touch the epiglottis; pressing now this organ toward the base of the tongue so that the finger shall be back of it, carry a curved and wrapped bistoury along the finger until it shall reach the swelling; cuts are now to be made from below forward. If the epiglottis is the part affected, and this is most commonly the case, the operation is rendered much easier; steadying the organ with the finger, it is to be incised as in the first instance. Subfig. 7 represents œdema of the epiglottis.



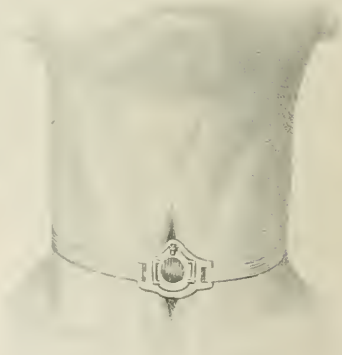


PLATE VII.

A VIEW OF THE OPERATIONS PERFORMED ON THE TRACHEA.

Fig. 1.—A front view of the Surgical Anatomy of the Trachea 1. Os hyoides. 2. Thyroid cartilage. 3. Thyro-hyoid muscles. 4. Crico-thyroid muscles. 5. Thyroid gland and veins in front of crico-thyroid ligament. 6. Rings of the trachea. 7. Common carotid artery. 8. Superior thyroid arteries. 9. Inferior thyroid artery. 10. Carotid artery, as divided. 11. Outline of the top of the chest. 12. Innominata artery. 13. Inferior thyroid vein. 14. Transverse vein.—*After Bernard and Huette.*

Fig. 2.—Relative position of the Larynx, Trachea, and Blood-vessels. 1. Os hyoides. 2. Thyro-hyoid ligament. 3. Thyroid cartilages. 4. Crico-thyroid ligament. 5. Cricoid cartilage. 6. Trachea. 7. Internal jugular vein. 8. Transverse vein. 9. End of inferior thyroid vein. 10. Veins.—*After Bernard and Huette.*

Fig. 3.—Relative positions of the great vessels concerned in operations near the top of the sternum. 1, 1. Internal jugular vein. 2, 2. Subclavian veins. 3. Subclavian artery. 4. Transverse vein. 5. Inferior thyroid vein. 6. External jugular vein. 7. Arch of the aorta. 8, 8. Primitive carotids —*After Bernard and Huette.*

Fig. 4.—A view of the operation of Tracheotomy, as performed by Mr. Liston. 1. The tenaculum inserted into the trachea. 2. Position of the bistoury in incising the rings. 3. Line and termination of the external incision.—*After Liston.*

Fig. 5.—Extraction of a foreign body by Tracheotomy, the head being thrown back and lowered, so as to facilitate the gravitation of the object. 1, 1. Blunt hooks holding open the wound. 2. Hand of the surgeon in the act of extracting the foreign body, by drawing it upward from the bronchia.—*After Bourgery and Jacob.*

Fig. 6.—A front view of the position and mode of retaining a canula in the Trachea, as usually practiced. 1. The incision. 2, 2. A tape attached to the wings of the canula and passing around the neck.—*After Bernard and Huette.*

Fig. 7.—The appearance of the parts concerned in Œdema of the Glottis. 1. The epiglottis cartilage, much swollen by serous infiltration of its submucous cellular tissue.—*After Gurdon Buck, Jr.*

Fig. 8.—The operation of scarifying the Glottis for the relief of Œdema. 1. The forefinger in its position as a director. 2. The knife in the act of scarifying the part.—*After Gurdon Buck, Jr.*

CHAPTER XIX.

THE GUMS AND THEIR DISEASES.

The gums are simply a greater or lesser amount of fibro-cartilaginous tissue (the fibrous far predominating) placed as protecting cushions about the alveolar processes. The neck of each tooth is closely enveloped by the dental pits of this cushion; the mucous membrane, which covers the common surface, being reflected around the pits, and rendered continuous with the periosteum of the alveoli.

The gums, in a healthy state, are rather remarkable for their insensibility, bearing, with very little or no response, the pressure and irritation to which, in the process of mastication, they are so continuously subjected. The mucous membrane, of which this tissue is really largely made up, is very heavy and thick compared with its continuity in other parts of the alimentary canal, and is underlaid by a network of vessels, which leads it to be esteemed of considerable vascularity as reference is had to operations involving it.

Inflammation is the disease of the gums, but such perverted vascular action, here, as everywhere else, has quite a variety of significations. These significations are—

1st. Accumulations of tartar.
2d. Periodontitis.
3d. The mercurial impression.
4th. Scurvy.
5th. Syphilis.
6th. Dead or loose teeth.
7th. A crowded dental arch.
8th. Use of improper dentifrices and brushes.
9th. Improperly inserted artificial teeth.
10th. Malignant impressions.
11th. Anomalous conditions.

A comprehension of the diseases of the gums is found in the appreciation of these various conditions or influences.

1st. *Accumulations of Tartar.*—Salivary calculus, a deposit from

the saliva, combined with the various oral débris, when attached about the necks of the teeth, necessarily becomes a source of offense, provoking inflammatory action, the grade of which is marked by the general condition of the individual. The most common type of inflammation thus induced is the chronic degenerative. The tartar, pressing upon the gums and insinuating itself about and around the necks of the teeth, soon interferes to such extent with the proper circulation in the part as to yield the puffy, turgid condition, so familiar in most of the cases. The mucous follicles lining the muco-dental pits have, of course, their secretive ability soon destroyed, and thus nothing prevents the insinuation of particles into these pits, and the consequent increase in the power of the offense. This irritation, uncombated, gradually progresses until the teeth become loosened and fall out, when, carrying with them the tartar, the parts recover.

All deposits, however, existing under the common name of tartar or salivary calculus, do not have such a destructive history. Thus, it is very common to observe a greenish deposit, particularly upon the teeth of the robust and uncleanly, which, so far as I have observed, seldom results in any particular harm. Another kind, the black, rarely exists but in very limited amount, and as rarely or never does any greater ill than slightly irritating the festoon; its situation is most commonly the lingual face of the inferior teeth. It does happen, however, that this description of tartar, or something very analogous to it, is sometimes provoked, as it were, in depraved constitutions, to extensive deposit; it is a kind of mixture or agglutination of tartar and sordes. The gums, from a constitutional influence, very much depraved, are irritated not unfrequently by this jagged deposit into a state very little short of gangrene; the breath is made offensive, and the oral fluids, by the admixture, rendered entirely unfit to be received by the stomach.

Yellow tartar, the deposit of the bilious and allied temperaments, is the kind most generally met with, and, as a rule, is most destructive to the integrity of the teeth and gums. It is not at all uncommon to find this deposit of such extent as to inclose in a common mass half a dozen or more teeth, while its power of insinuation and destruction is so great that, before attention may have been directed to the process, the alveoli will be found destroyed and the teeth ready to drop from the mouth. I have, in my own practice, frequently been consulted in these cases, where nothing was of any avail but the removal of the implicated teeth. This description of calculus is evidently a direct deposit from the saliva, its situation cor-

responding with the location of the salivary orifices. I think it will be found always associated with a sluggish condition of the secretive action of the glands, as I am sure its most reliable prophylaxis is found in their stimulation. This tartar has a rough, dry surface, and is generally most easy of removal, flaking away in masses at the slightest touch of the instrument. The effect of its presence upon the gum is to force it away from the teeth, or rather, it might be more correct to say, to lift the teeth from the gums and their alveoli, destroying entirely any relation of attachment between the parts. The gums themselves, under its irritating influence, become puffy and soft, and occasionally so tender as to render, in many cases, unbearable the ordinary pressure exerted in mastication, so that the patient is compelled to subsist exclusively on soft food, or employ other than the natural process of comminution. (See *Chapter on Salivary Calculus.*)

2d. *Periodontitis.*—Ulitis from periodontitis is not at all difficult to distinguish, and corresponds in character with the primary lesions in being acute or chronic. If a tooth is acutely inflamed in its periodonteum, it is sore to the touch, and elongated. If it is chronically inflamed, it is loose or discolored. Inflammation in the gum is simply an inflammation of continuity. If the patient is in good health, the action will be circumscribed; if the reverse, it may of course influence. To treat such an inflammation, the health of the tooth or teeth is to be restored. An inflamed periodonteum is commonly associated with a dead pulp; this is the first source of offense for which we naturally look. If such a condition is found, and no cavity of communication exists with the pulp canal, it will, in nine cases out of ten, only be necessary to make such communication, and the trouble quickly enough disappears. Tartar is the frequent source of chronic periodontitis. Fish bones, or other foreign bodies, forced into the membrane in mastication, excite inflammation.

Acute periodonto-ulitis uncontrolled ends in parulis, and from such acute termination is very apt to pass to chronicity. Chronic ulitis presents the condition of continued turgescence, soreness, loose teeth, or fangs; suppuration frequently occurs at the seat of the original abscess, and sometimes, from the affected alveolar pits, its cure, like that of the acute condition, resides in a treatment directed to the teeth. (See *Periodontitis and Alveolar Abscess.*)

3d *The Mercurial Impression.*—Mercury first yields decided evidence of its action by producing in the mouth a metallic taste, complained of as coppery. A little time, and this taste is accompanied

with some increase in the quantity of the saliva; still later the festoons of the gums will be found congesting, commencing generally about the necks of the lower central teeth. Succeeding this congestion we have the dull whiteness, indicating the change in the epithelial tissue (a form of aphthæ). There now follows the elongation of the teeth, increased salivary flow, stiffness of the gums, enlargement of the tongue, foul breath, etc.

The effects which mercury shall produce on the mouth, or system at large, depends on the quantity administered and the susceptibility of the individual. I have myself exhibited the medicine in quantities of from fifteen to twenty grains in the course of three days without being able to perceive the local action; while, on the contrary, I have known five grains to so swell the tongue that it required much effort to prevent the patient being smothered. Children from five to ten years of age have seemed to me markedly susceptible. I removed, a short time back, the whole of the left half of the body of the lower jaw, dead from but some three grains of calomel, as averred by the practitioner who administered the medicine The patient was seven years of age. Mercurial ulitis, when confined alone to these parts, signifies but slight effect on the part of the action of the agent; and the immediate cessation in its employment will generally result in the disappearance of these effects. If this should not, however, prove the case, I think nothing better can be done than to scarify, and paint the gums with tinct. of iodine, graduated to each particular case, say, as a rule, half and half of the officinal tincture and water. Chlorate of potash as a wash, and used internally, may also be employed. To an adult, ten grains of the salt, dissolved in a tablespoonful of water, may be given four or five times in a day. As a local application, one drachm to the ounce of water is a very good strength. The bowels are to be kept in a lax condition by the administration of Seidlitz powders or other saline cathartics. Where mercurial ulitis passes to that stage which results in the breaking down of the tissue, and this is sometimes the case where even adjacent parts are not markedly affected, the treatment required is much more imperative, and pertains, as a rule, quite as much to the constitution at large as to the mouth itself. Locally, the fetor will urgently demand attention, and one of the best means to correct this will be found in the use of a solution of the permanganate of potash, such solution varying in strength from two to ten grains to the ounce of water. Constitutionally, vigorous tonic medicaments are required,—not the least important of which are the iron and bark

preparations. If hemorrhage intervenes, it may be necessary to employ opium and lead internally; or, as suggested in another part of this work, tinct. Erigeron Canadense, in doses of one or two drops, repeated occasionally until such bleeding is controlled. Locally, cobweb saturated in alum-water may be used. Laid carefully upon the bleeding part, and retained in position, it will seldom be found to fail. Monsel's solutions should not be used. The tendency in extreme cases toward sloughing is a matter constantly to be borne in mind. When the tumefaction is very great and indolent-looking, the parts are still to be incised and the iodine applied; but both remedies are to be used with judgment and caution. I have known gums in the condition alluded to, and which might perhaps have been recovered, sloughed in mass by applications of strong tincture of iodine. Always let the incisions at first be few, and the tincture at least two-thirds diluted. The dilute aromatic sulphuric acid is also a happy local remedy in these conditions. It may be mixed with water until the acid taste is comfortably bearable—about ℥i to ℥viij of water. A combination which I also occasionally use with much benefit is composed as follows:

℞.—Potassæ chloras, ℥ss;
Sodæ boras,
Alumen pulv. āā ℥ij;
Potass. permang. grs. xxv;
Aqua cologn. ℥ss;
Tinct. cinchonæ, ℥ij;
Tinct. myrrhæ, ℥i;
Infus. quercus (fort.) ℥iv. M.
Sig. Gargle the mouth pro re nata.

If, in defiance of all that is done, the parts should slough, one of three things occur: the disease will seem to have exhausted itself, and the parts, after a little rest, give evidence of recovery; or the bone follows the ulcerative action, and sloughs likewise; or the patient dies from irritation and exhaustion. (For treatment of Caries and Necrosis, see other pages.)

4th. *Scurvy.*—Scurvy proper, such as decimated the legions of Louis the Ninth, and in even later days was so frequently the scourge of protracted sea voyages, is a condition which modern science and judgment have so combated that it may be trusted that few of us will ever have occasion to meet with or treat it. Modified forms of the disease are still, however, prevalent enough, and exist,

with great variety of features, from simple indolent ulitis to general purpura.

Puffiness of the gums, scorbutic in nature, is fairly judged, I think, from its dull, purple aspect, independent of its varying constitutional conditions; this venous congestion compares pathologically with the effusions of purpura proper. It would not, however, be at all truthful, or in accordance with the facts, to describe any particular train of constitutional conditions as constantly associated with the scorbutic sore mouth, as met with in ordinary practice, and for the reason that nothing else of the disease may appear but the local manifestation. That it is a constitutional affection, however, and not a local disease, is proven from the fact of absence of any source of local irritation, and from the further fact of its constant presence in the mouth, let the disease possess whatever other manifestations it may.

"Scurvy," says Dr. Wood, "is generally very gradual in its approach, so that it is scarcely possible to say, in any particular case, what was its precise time of attack. Attention is commonly first attracted by an unhealthy paleness of complexion, a feeling, on the part of the patient, of languor and despondency, with an indisposition to bodily action, and unusual fatigue after exercise; a sensation of weariness and aching in the limbs as from overexertion, though the patient may have been at rest; and some swelling, redness, and tenderness of the gums, with a tendency to bleed from slight causes. With the advance of the disease the face becomes paler, and assumes a somewhat sallow or dusky hue, and often a degree of puffiness; the lips and tongue become pallid, and contrast strikingly with the gums, which are purple or livid, especially at their edges, rise up between and around the teeth, are soft and spongy, and bleed from the slightest touch; the breath is offensive; purplish spots or blotches appear upon various parts of the surface, beginning usually upon the lower extremities and afterward extending to the trunk, arms, and neck, though seldom affecting the face; hemorrhage frequently occurs, most commonly from the nose, gums, and mouth, but sometimes also from the stomach, bowels, and urinary passages; the feet become edematous, and the legs swollen and painful; the general debility increases; and muscular exertion is apt to be attended with palpitation of the heart, panting, vertigo, dizziness, and a feeling of faintness. The petechial spots are obviously owing to the extravasation of blood within the cutaneous tissue. Occasionally portions of the surface look as if bruised without having suffered

any violence; and blows, which, under ordinary circumstances would produce no effect, now give rise to extensive ecchymosis. Should the disease continue, all the symptoms become aggravated, the complexion assumes often, with its paleness, a livid or leaden hue; the gums swell greatly, and put forth a blackish fungous growth, so as sometimes to conceal the teeth, blood continually oozes from them; sloughing occasionally takes place, laying bare the necks of the teeth, and extending, in very bad cases, even to the cheek. The teeth become loose, and sometimes fall out; the patient is unable to chew solid food in consequence of the state of his gums. The breath becomes intolerably offensive; hard and painful tumefactions occur in the calves of the leg, among the muscles of the thigh, upon the tibiæ and lower jaw, and in the hand, with stiffness and contraction of the joints, especially the knee, and severe pain in the extremities upon every attempt at movement; and the debility, before so prominent a feature in the case, now becomes excessive, so that the least exertion is dangerous, and the patient sometimes dies suddenly upon rising from bed, or upon being conveyed, without great caution, from one place to another. Wounds, even slight scratches, degenerate into unhealthy ulcers; old cicatrices break out afresh, and existing ulcers assume a new and much worse aspect. The bones are said to be softened, united fractures are again opened, and in the young, the epiphyses separate sometimes from the shaft.

"Throughout the complaint the tongue is usually clean and moist, and the appetite and digestion remain unimpaired almost to the last, unless the disease, as sometimes happens, should be complicated with fever. Indeed, there is often a craving for food, especially for fresh vegetables and fruits; occasionally, however, there is vomiting, with epigastric distress and other evidences of stomachic disorder. The bowels are mostly costive, and in some cases obstinately so, but diarrhœa not unfrequently intervenes, with black or bloody and offensive evacuations. The pulse is generally small, feeble, and slow, but cases occur in which it becomes very frequent, and the surface of the skin febrile, probably from the sympathy of the system with various local irritative congestions. Great emaciation usually attends the disease when severe or lasting, but not invariably. Little cerebral disturbance is ordinarily observable, and the patient often retains full possession of his senses and intellect to the last."

This description, condensed from Dr. Wood's valuable paper on the subject, describes the disease in perhaps its severest forms; I have never seen such cases of scurvy, although at different times

meeting considerable of it as manifested in the persons of sailors and others brought to hospitals for treatment. Dr. Foltz, U. S. N., in a report made by him on the scurvy which appeared in the blockading fleet of the Gulf of Mexico, states that "lassitude and indisposition to muscular energy were not among the symptoms which ushered in the disease, and that there was great activity, and not unfrequently cheerfulness, good appetite, and sound sleep at night, after the teeth were loosened, the gums ulcerated, the limbs edematous and discolored; and when at last the patient gave way, it was not an indisposition to corporal exertion, but an actual disability."

Authors, however much they may disagree in their descriptions of such various cases as have come under their observation, are all agreed that scurvy results from the absence of fresh fruits and vegetables, or their juices, necessary to furnish some principle required in the blood, and which is not, in such absence, otherwise obtained. In the treatise published by Dr. Hamilton on Military Surgery, the author says: In regard to the pathology of scurvy, the belief prevails that it is due essentially to the absence of certain staminal principles from the blood, and especially potash. It appears to be a pretty well ascertained fact that all, or nearly all, of those remedies which have been employed successfully in the prevention or cure of scurvy, contain potash. Potatoes, cabbage, celery, lettuce, lime, lemon, and orange juice contain it in large quantity, unless their salts have been expressed by the application of heat, as in boiling, or other modes of cooking. Lime, lemon, and orange juice contains nearly one grain of potash to every ounce of the juice.

One ounce of potatoes yields one grain and a half, while one ounce of rice yields only ·005 of a grain. The substitution of rice in an English workhouse for an equal amount by weight of potatoes was followed in a short time by scurvy.

In the ordinary scurvy of the gums, which every practitioner is aware presents itself more frequently in the very early spring, when the old vegetables have been pretty well exhausted and the fresh ones have not begun to grow, it is the common experience to discover that the patients have existed almost exclusively on salt meats; hence it is much the most frequently met with in the poorer class of farm-laborers. The gums, in these cases, are of a purple color, turgid, with the dental pits discharging pus, the teeth loosened, the breath offensive, but the face not by any means pale, nor the habits languid; indeed there is little or nothing to signify that the local

manifestation is a systemic offspring. When the condition is extreme, it is not uncommon to have fungoid growths (epulo-fungoid tumors), alluded to by Dr. Wood, springing from the edges and depths of the dental pits.

Treatment.—It will be found good practice to treat these conditions locally, as directed in mercurial ulitis. Constitutionally, however, different indications are to be met; a something possessed by a vegetable and acid diet is required by the blood; without stopping to discuss the question whether this may or may not be potash, we act on the empirical conviction, and at once direct such diet. Then the depressed or perverted life force is to be elevated or relieved, and to this end nothing can equal the sheet-bath, taken with water moderately warm and moderately salt: saturating the sheet, it is quickly thrown around the body, and the patient or an assistant rubs the sheet over the flesh until the whole person is in a ruddy glow; this is repeated each morning immediately on rising.

As medicine, the vegetable acids may be freely used. Lemonade is perhaps quite as good as anything that can be given. A combination which has some celebrity, is known as Turner's antidote; it consists of ℥ij of potassæ nitratis, mixed in ℥viij acidi acetici, administered in tablespoonful doses ter die.

5th. *Syphilis.*—Syphilitic ulitis, I judge, from my own experience and observation, not to be an inflammation of the gum tissue proper, but simply of its mucous envelope, or, on the other hand, it is an inflammation commencing in the periosteum, and secondarily affecting the gum tissue. I do not think I have ever seen a case of pure uncomplicated syphilitic ulitis, while few conditions are more common than mercurio-syphilitic ulitis and osteo-ulitis of syphilitic origin. The appreciations of such conditions are, of course, not at all difficult; the history of the case alone is sufficient to give the diagnosis, while to the experienced eye a moment's glance is enough to reveal such history. If the inflammation is confined to the mucous membrane, the full extent of its surface will be more or less affected, its color will be a dull red, it will be more or less tender to the touch, and most likely ulcerated. If, on the contrary, the bone or its periosteum is the primary seat of trouble, the gum may simply be thrown up by the effusion beneath it; or if it happens that the gum itself has become inflamed, the action seems inclining to localize itself as much as possible This, however, depends on the state of the parts beneath, and the treatment that is being pursued.

If the condition is one of pure uncomplicated venereal ostitis, the excitement in the gum will be found localized to the immediately overlying parts; but if a mercurial treatment has been pursued, we then may have any extent of complication. The treatment to be pursued in these cases is to be founded on existing conditions.

6th. *Dead or Loose Teeth.*—Dead teeth affect, secondarily, the gum structure by continuity with the inflamed periodonteum. A dead tooth, periosteally inflamed, is always sore to the touch, is more or less elongated, and is discolored. An ulitis connected with such diseased tooth or teeth is plainly discoverable by the absence of other sources of irritation; relief follows, of course, the cure of the primary lesion.

7th. *Overcrowded Condition of the Dental Arch.*—(See *Chapter on Anomalies of Dentition.*)

8th. *Use of Improper Dentifrices and Brushes.*—Many gums are subjected to continuous irritation and inflammation from the use of agents in the way of dentifrices, brushes, or other dental applications, which, either chemically, vitally, or mechanically, predispose and excite to deterioration. Perhaps in the whole range of practice there is, in no single instance, less attention given to the requirements of the various cases than is manifested in the prescribing of tooth-cleansing powders and washes. Charcoal, a favorite agent with many, while most excellent in its place, is one of the most abused of these remedies. How very common is it to find, after a few weeks or months of the use of this material, the gums becoming pitted with black spots about the necks of the teeth and loosening from them. This is a result of the insolubility of the agent in the fluids of the mouth; gradually, but surely, it finds its way within the mucous pits, and not being either washed out or dissolved by the secretion, it quickly enough destroys the integrity of the relation; hence follows chronic periodontitis and the eventual loss of the teeth,—the mass of gum tissue sympathizing during the whole period,—producing chronic ulitis.

Pulverized coral and pumice are other agents mechanically destructive, although in their places very good, and, as will be remarked, recommended. Castile or other soaps, too freely used, degenerate by the action of their alkalinity. Thus a constant use of such agents is quite certain to be attended by puffiness and chronic turgidity of the gums, by degenerated mucous discharges, and by an offensive breath. Acids, on the other hand, employed of too full a strength, inflame and irritate the gums, put the teeth on

edge, by dissolving their mucous envelopes and more or less of their lime salts. An ulitis from the irritation of acid agents differs, however, from that produced by the alkaline, in being of a free, generous, acute, or, at worst, subacute nature, easy of control, and much more injurious to the teeth than to the gums themselves. Irritation of the gums commonly associates with injury done to the teeth. We may refer to the following most interesting experiments performed several years back by Dr. A. Westcott:

"1st. Both vegetable and mineral acids act readily upon the bone and enamel of the teeth.

"2d. Alkalies do not act upon the enamel of the teeth; the caustic potash will readily destroy the bone by uniting with its animal matter.

"3d. Salts whose acids have a stronger affinity for the lime of the teeth than for the basis with which they are combined are decomposed, the acids acting upon the teeth.

"4th. Vegetable substances have no effect on the teeth till after fermentation takes place; but all such as are capable of acetic fermentation act readily after this acid is formed.

"5th. Animal substances, even while in a state of confined putrefaction, act very tardily, if at all, upon either the bone or enamel. On examining the teeth subjected to such influences, the twentieth day of the experiment, no visible phenomena were presented except a slight deposit upon the surface of a greenish, slimy matter, somewhat resembling the green tartar often found upon teeth in the mouth."

Dr. Westcott also adds the following experiments with agents in very common use, some of which are very frequently most loosely and injudiciously prescribed in tooth-washes and powders:

"Acetic and citric acids so corroded the enamel in forty-eight hours that much of it was easily removed with the finger-nail.

"Acetic acid, or common vinegar, is not only in common use as a condiment, but is formed in the mouth whenever substances liable to fermentation are suffered to remain about the teeth after any considerable length of time.

"Citric acid, or lemon juice, though less frequently brought in contact with the teeth, acts upon them still more readily.

"Malic acid, or the acid of apples, in its concentrated state, acts also promptly upon the teeth.

"Muriatic, sulphuric, and nitric acids, though largely diluted, soon decompose the teeth. These are in common use as tonics.

"Sulphuric and nitric ethers have a similar deleterious effect, as also spirits of nitre. These are common diffusible stimulants in sickness.

"Supertartrate of potash destroyed the enamel very readily. This article is frequently used to form an acidulated beverage.

"Raisins so corroded the enamel in twenty-four hours that its surface presented the appearance, and was of the consistency, of chalk.

"Sugar had no effect till after acetous acid was formed, but then the effect was the same as from this acid directly applied."

A very common cause of ulitis in persons with carious teeth results from the too free use of creasote. This agent, used pure, is a powerful irritant, and has been the cause of some of the most severe acute inflammations. Seen early, the cases exhibit the direct effect of the agent in the escharotic result that has been produced on the mucous membrane,—this being white, pasty, and sloughing. Outside of the immediate local use of oil or butter, if it is inferred that free creasote remains about the mouth, such cases are to be treated on common principles. A case occurred, some short time back, in my own practice, where a girl, with an intent to commit suicide, swallowed two drachms of the agent. Called immediately, I used as an emetic the first thing at hand, namely, the soap on her wash-stand, and followed the emetic with half a pound of common table-butter. No particular bad results occurred; the patient had a more or less sore mouth, œsophagus, and stomach for three days, after which she seemed about as usual.

Chloride of zinc, used in the mixing of the so-called bone plugs now so freely employed in dental surgery, is another of the causes of ulitis. Its action may be of a twofold character: either directly upon the gum tissue, as by its careless use it is allowed to come in contact with it, or through a periodontitis excited by the action of the agent on the dental pulp. From this cause, cases occur in which large portions of the gums are destroyed; and not unfrequently the action extends to the alveolar process, necrosing the sockets of the teeth.

A cause of chronic ulitis, which has been occasionally met with, consists in a wedge of gold or other metal forced into the dental pit by the dentist, while in the act of filling a tooth on its approximal face. A matter of this kind is very apt to be overlooked by the general practitioner, hence an unappreciated stubbornness in his case. When ulitis is circumscribed, and the center of the trouble seems to

be a tooth filled on an approximal surface, attention may be first directed to such condition. Let the practitioner take a strand of common ligature silk, and, passing it between the teeth, feel if it runs freely about the necks; if it should catch, the probability is he has discovered the trouble.

The too free use of arsenical paste in the destruction of the dental pulp is a frequent source of utilis. I have seen two or three very severe cases from such a cause. In the use of this remedy, it is in every instance well to cover it in the cavity with a particle of wax, or where this is not admissible (and there are certainly cases enough where it is quite impossible), then a tuft of cotton, saturated with gum sandarac, is placed over the application, and protected for a few moments until it hardens. In inflammation from this cause the immediate local use of the sesquioxide of iron has been recommended; but, personally, I have seen no good results from it, the harm being done before the patient applies. Syringing the parts thoroughly, and a treatment directed on general principles, is all that can be done.

Brushes used in cleansing the teeth, from their over-stiffness, are frequently a source of offense, really tearing the epithelium at each cleansing, from the mucous membrane; the patient complains of the soreness and bleeding of the gums every time the teeth are brushed, yet seems to fail in recognizing that he himself produces the trouble.

9th. *Improperly inserted Artificial Teeth.*—Ulitis, resulting in fungoid degeneration, and in the most troublesome of chronic conditions, is frequently witnessed as the result of ill-adapted dentures and of unsuitable material employed in their construction. Teeth inserted on plates held in position by clasps or bands attached to certain teeth, are a prolific source of offense. Where the bearings of a plate are not accurate, the bands cut into the gum, fret and irritate them, until, in the end, the teeth to which the clasps are attached are loosened, the gum passes to a chronic degeneracy, puffs up, losing much of its vitality; otherwise a hypertrophied ring of the tissue, hard and callosed, surrounds the diseased tooth, and serves as a sort of protection to the adjoining parts. A case just now comes to my mind in which a lady, wearing an upper set of teeth, supported partially by atmospheric pressure and partly by a band passing around the only natural tooth in her mouth, had provoked, in this socket, an epulo-fungoid growth of such threatening character that, failing to cure it by ordinary means, I felt compelled to advise an operation as the only hope of saving her life. Epithelioma

I have also seen located by a similar cause; having, in my own practice, the misfortune to lose one such case. In Mr. Heath's Jacksonian prize essay, drawings are given of certain papular hypertrophies (thought by the author to be quite rare specimens) on the oral mucous membrane. These hypertrophies I have frequently seen on the membrane beneath the cavities of suction plates; they look like enlarged and indurated fungiform papillæ. Another form of such hypertrophy is induration of the membrane in full, lying beneath the cavity; the parts are raised by subeffusions, which organize and become as hard almost as cartilage. Still another form is the rugose—several wheels running across the space; these indurations I have never known do any harm. In some instances they remain permanent after the removal of the offense; but, as a rule, they will be found to disappear in a few months after a plate is taken away. Indeed, I met one lady having these hypertrophied papillæ, who told me she had had them for over a year, and had never ceased to wear her plate.

Hypertrophy of the gum in mass occasionally results from the mechanical irritation of dental plates. I am, at the time of writing this, treating a lady suffering under such an enlargement; the trouble is in the upper gums, and they seem like thickened masses of gristle, and, I am sorry to say, prove about as insensible to medicinal impressions.

Vulcanite, a material much employed in the construction of dental plates, is, to many mouths, a source of unbearable offense. The cases that have come under my own observation have been all alike, —soft, flabby, relaxed, congested, and very sluggish in recuperation, —the gum tissue seeming to be softened from surface to base. Acid and astringent lotions are best adapted to the cure.

Silver is another material that it would, perhaps, be as well to dispense with in the construction of dental appliances; also gold too much alloyed with copper, running down, as it is sometimes found, to fourteen carats.

10th, 11th. In other parts of this work I take occasion to treat, under what is deemed to be proper heads, various conditions, commonly associated under the common appellation of gum diseases, as, for example, the epulic growths considered in succeeding chapters.

Observation of Fig. 61 exhibits a congestion which has swollen the gums and tissues of the hard palate to an extent which conceals almost completely three posterior teeth which remain in the parts.

The patient, from whose mouth the drawing was made, had worn a plate of vulcanite nine months; the parts were a dusky red,—flabby, relaxed, and exceedingly indolent. There was no particular complaint of pain,—simply a soreness, together with a tenderness on pressure,

FIG. 61.—VIEW OF GUMS INFLAMED BY VULCANITE PLATE.

which gradually had increased until the removal of the piece became a necessity. The cause of irritation from these plates is variously considered: the most likely, however, of which is the very complete exclusion of atmospheric air, and the consequent heating which follows. To cure such cases it will be found, in most instances, a necessity to remove the denture, after which stimulating and astringent gargles may be prescribed. A wash, used in the particular case above described, which acted to entire satisfaction, was compounded as follows:

℞.—Aqua Cologn. ℥i;
Tinct. capsici comp. ℥i;
Sodæ boras, ℥ij;
Tinct. cinchonæ, ℥ij;
Tinct. pyrethri, ℥i;
Aqua, ℥iij. M.

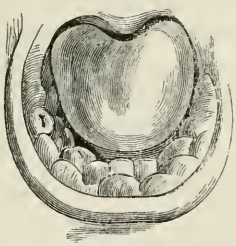
Cases of hypertrophy from ill-fitting clasps or ill-fitting plates are not unfrequently met with; sometimes such an induration will be found circumscribing a single tooth to an extent which half conceals it, the band being accommodated in a space existing between the gum and tooth. I have known such cases to give much concern by the obstinacy of their persistence after the removal of the cause of offense; but such anxiety is seldom well founded, for even should the induration remain it will exhibit no tendency to degenerate. In the treatment it is only desirable to remove the offending band, and leave the case to nature.

As general hypertrophy of the gums is concerned, I might illustrate the condition by referring to a case at present under treatment. The patient, a lady in fine health, middle aged, wears a plate of gold containing seven scattered teeth. Wherever this plate bears, the parts are enlarged, indurated, and scirrhus-like. If it were not for the absence of the peculiar pain of carcinoma one might very readily infer the presence of such disease. The only explanation of such induration is to be found in the imperfect adaptation of the denture, conjoined, perhaps, with a cachexia. The treatment has been the very simple one of advising the patient not to wear the plate, nor any other, until a cure is obtained. No medication has been deemed necessary.

Still another class of cases exists in the hypertrophy of the mucous membrane lying beneath the surface of suction cavities. Sometimes this surface will be found simply thickened and hardened; at other times it will be seen broken into deep fissures; still again it is observed studded with papillæ, fungiform in character, and not unfrequently possessed of a tendency to hemorrhage. I have met with these various cases where quite serious results seemed threatened, although but in a single one did ever any ill consequences ensue. In this one case necrosis of the underlying bone exposed the nares.

Treatment.—This is generally to be tentative; the plate must be removed, or at least the suction cavity must. If the parts do not recover after such removal of the offense, it may be found desirable to touch with zinc, iodine, or capsicum. If caries or necrosis should ensue, such conditions are to be treated as referred to in the chapter on these diseases.

Fig. 62.—View of Case of Congenital Hypertrophy.



An interesting case exhibited in the cut, markedly illustrative of the condition, is described in Professor Gross's System of Sur-

gery: "The gum of the upper jaw formed a tumor of a pale color, inelastic, perfectly insensible, and of firm consistence, presenting very much the appearance of the snout of a hog. It was rough on the surface, and was about an inch and a quarter in its antero-posterior diameter, its width having been about one inch and a half. At its free margin, which was quite irregular, was seen the tip of the left central incisor. Extending back from this tumor, on each side of the whole length of the jaw, was the enlarged gum, forming a thick, broad ridge, completely imbedding the teeth. At several points, particularly behind, the morbid growth was more than nine lines in width; in front, and at the middle, it was less. It was of a more florid color than the main tumor, but of about the same degree of consistence. Opposite the bicuspid teeth on each side, it exhibited a remarkably granulated appearance, the excrescences having a pediculated form, and being folded upon each other. Projecting toward the roof of the mouth, it greatly encroached upon this cavity, lessening its capacity, and thus interfering with its function, as well with speech and respiration.

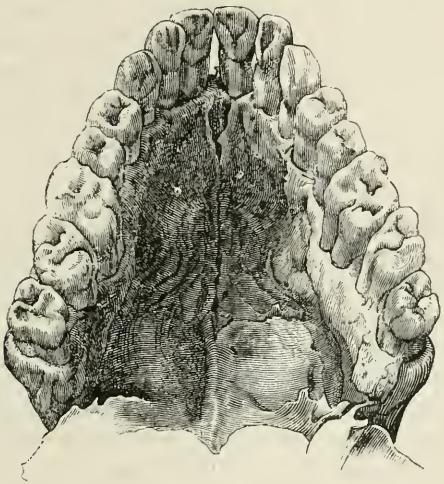
"The lower gum was in the same condition as the upper, being equally hard and insensible, but less developed. It was of a bluish, florid complexion, and larger in front and behind than at the intermediate points; its free surface was uneven, and so prominent as to hide all the teeth, except the central incisors, the point of the right cuspid, and the cusps of each deciduous and first permanent molars."

The treatment in this case consisted of thorough removal by means of scalpels and scaling instruments. A good deal of blood was lost, and the operation, which had to be several times repeated, was necessarily tedious. Professor Gross remarks that Dr. J. N. M. Lynch, whose patient the boy was, informed him four years after the operation, that the condition was returning, and that it was accompanied with marked disease of the heart, with considerable enlargement of the tonsils, arches of the palate, and the papillæ of the tongue.

Fig. 63, a case of chronic ulitis, with recession, is a type of a most common condition, and has a great variety of meanings. The principal cause of such recession is found, however, according to my own experience, in the accumulation of small quantities of tartar just below the free edge of the gums. A second cause, and a very prominent one, lies in a solidification of the tooth structure,—the

equilibrium of circulation existing between the tooth pulp, periosteum, and gum being thus disturbed. Causes strictly local, however, need only concern, as the appearance of the parts and the health of the teeth are concerned; they are susceptible of remedy, needing only attention and the proper skill. It will be readily inferred, from what has been said on previous pages, that local lesions are not alone to blame for such conditions. "In forming a judgment," says Mr. Bell, "upon cases of this description, and even upon those in which the loss of substance is associated with more or less of diseased action, it is necessary to recollect that the

FIG. 63.—VIEW OF CHRONIC ULITIS, WITH RECESSION.



teeth in old age are removed by this identical process, namely, the destruction of their support by the absorption of the gums and alveolar processes; and as this step toward general decay commences at very different periods in different constitutions, it may, doubtless, in many cases, even in persons not beyond the middle period of life, be considered as an indication of a sort of premature old age, or an anticipation at least, of senile decay, as far as regards these parts of the body."

In depressed conditions of the life force, as witnessed in the habitual drinker and debauchee, such recession is generally found conjoined with suppuration, and affects all the parts alike; the gums are turgid, sluggish-looking, and more or less purple; the mucous

membrane lining the mouth and throat is a dirty red; the tremor and prostration of the system at large show the constitutional nature of the offense.

Another form of this recession is associated with the sickly and weak; here, however, the part is even lighter than in health, is shriveled and shrunken, clasping the neck of the tooth tightly and closely,—seeming, indeed, shrinking within itself. These cases are always anæmic, being found usually in the female sex, or in males inclining to phthisis. In short, as remarked by Dr. Harris, "every disease of the general system tending to increase the susceptibility of the gums to the action of local irritants favor the production of the condition." Everything that tends to induce such conditions may be regarded as predisposing causes: such are bilious and inflammatory fevers, the excessive use of mercurial medicines, the venereal virus, any and everything tending to the deterioration of the fluids of the body. Persons of cachectic habit are far more subject to it, and generally in its worse forms, than those individuals in the enjoyment of good health. Because of the truthfulness of such assumptions it is seen that the condition is an occasion of warning. In my own experience I have not unfrequently recognized that such a recession of the gums was a first indication of a finally destructive disease.

Treatment.—This is of course to be directed to the cause. Where this shall be found to be of a strictly local nature, most excellent effects are occasionally secured by scarifying the affected gums three or four times a week, and touching them lightly with chloride of zinc, a solution in strength of about grs. xx to water ℥i. Sometimes, and I have occasionally succeeded much to my satisfaction, the edges may be pared and brought together with a single stitch; this little operation, however, only applies where the tissues are reasonably loose and fairly healthy, and the recession is V-shaped. Compound tincture of capsicum is an excellent provocative of granulations. Iodine also acts happily, but it should not be allowed to touch the teeth,—the parts are always to be scarified to allow such applications to be of any service. The various washes recommended are, of course, useful or not so, according as they may be adapted to the peculiar indications; of these, the stimulating and astringent will be found most frequently demanded. Where the teeth are thus exposed without apparent lesion, either of a local or general nature, the trouble is to be esteemed as incurable.

Congenital Union of Gums.—Dr. W. S Carter reports the following anomalous case, which, with a few others, we present as in-

teresting studies in this direction of oral troubles: "Mrs. W. was delivered, after an easy labor at full term, of a living male child. The infant was perfectly quiet for a few moments after its birth, and then spasmodic respiratory efforts were made. Thinking the throat might be obstructed by mucus, I endeavored to introduce my finger to remove it. The finger passed readily between the lips, but to my astonishment I could get it no further than the gums, which both by sight and touch I found firmly united.

"As it was necessary to act promptly, I immediately, with the assistance of my partner, Dr. Tilford, divided the tissue uniting the gums. This appeared to be about as thick as the gums, and was cartilaginous, extending as far back on either side as the angle of the jaw. Notwithstanding this free division, which enabled the child to breathe with more facility, the jaws were immovable.

"After letting the patient rest a few hours, Dr. Sellers, of Brownsburg, visited the patient with me; and it was decided to use some force to separate the jaws, and make a further careful exploration. This exploration showed us a tough membrane, one-eighth of an inch in thickness, passing from the palate bone above, and inserted into the lower gum. Upon the division of this and the use of some little force, the jaws were separated.

"In two weeks the gums had healed, the child took nourishment readily, and was doing well.

"Other malformations also existed in this case, viz.: the fingers and toes were webbed, and the ears were in rather a rudimentary condition—the integument passing from the head over the anterior surface of the upper third of each of these.

"When the mother was about three months pregnant, her son, about six years of age, had a severe convulsion, the jaws being spasmodically closed. She was alone at the time, and her terror was excessive; and, indeed, since then, during all the remaining months of her pregnancy, she states the frightful scene has scarcely ever been absent from her mind."

"We have delayed," remarks the editor in whose journal this interesting communication appears, "for some weeks the publication of Dr. Carter's extraordinary case, in order that we might, if possible, find recorded some similar cases or case; but after a diligent search we have been utterly disappointed. Even Saint-Hilaire, to whose study of the various anomalies of organization science is so greatly indebted, fails us in presenting any analogous instance.

"While almost any one of the external openings of the body may

be imperforate, yet this condition much oftener affects the inferior than the superior orifices of the trunk—*e.g.* closure of the anus as a congenital condition is more frequently met with than closure of the eyelids, closure of the vagina than of the external auditory meatus.

"In regard to congenital adhesions of the mouth hitherto described, they have been from adherence, sometimes complete, in other instances partial, of the lips. Even this malformation the illustrious Boyer spoke of as a possibility, never having seen it; but Velpeau discovered that Haller had pointed out its occurrence in the human species and also in the inferior animals, that Schenkius had met with cases upon which he had to operate, and that Desgenettes had seen a seven months' fœtus with imperforate mouth.

"In Saint-Hilaire's work, chapter iii., *Des Anomalies par continuité des parties ordinairement disjointes*, section i., *Des Anomalies par Imperforation*, will be found the following, which may be of some interest in connection with Dr. Carter's report: The imperforation of the nares is much less frequent than that of the eyelids; nevertheless, Littré and Jean Bianchi have seen it in subjects in whom other irregularities also were found, and Oberteuffer has also several times observed the same condition.

"In the case mentioned by Littré, the closure of the nares was complicated with closure of the mouth, the skin passing over both apertures, an anomaly of still less frequent occurrence. The closure of the mouth has also been seen where the nares were unobstructed, but these cases presented various other deviations also.

"As to the possible influence of the sudden and severe terror to which the mother was subjected, which Dr. Carter mentions, in causing the malformation, it probably is better neither to affirm nor, still less, to deny. Certain it is that the tendency of the observant and thoughtful in our profession is, not to reject as 'old wives' fables' all that is told us of the very strong influence of maternal impressions upon the fœtus, fables which have so long found such general credence with mothers and with the public. Those who are interested in the study of this question will find an admirable and philosophic discussion of it, by Dr. Alfred Meadows, in the seventh volume of the *London Obstetrical Society's Transactions*. It occurs in connection with the report of a case of *Monstrosity*, given by Dr. M., the mother attributing the deformities of her offspring to the fact that during the earlier weeks of her pregnancy she was greatly horrified by being shown some of Aristotle's plates, in which were ex-

hibited some deformities resembling this, and specimens of other monstrosities."—(*Western Journ. of Medicine.*)

"*Stomatitis and Pharyngitis Leucæmica.*—In *Virchow's Archives*, Dr. F. Mosler relates the case of a male 40 years old, and previously of sound health, in whom, in the course of some fifteen months, there took place gradually a swelling of the glands on both sides of the throat, attended with inflammation of the mucous membrane of the mouth and pharynx, with flaccidity of and hemorrhage from the gums, followed by swelling of the axillary and inguinal glands, and finally of the liver and spleen. There was now an evident increase in the white particles of the blood. In the case described, the only etiological agent to which the morbid phenomena it presented could be referred was inordinate exertion of mind and body. The condition of the throat was of especial interest. Its mucous membrane was red and swollen, and over its surface there were spread numerous medullary elevations having a smooth shining appearance. Both tonsils were enlarged, and their surfaces presented the appearance of a congeries of large, dense, medullary knots. The secretions of the surface of the mouth and larynx and of the salivary glands were greatly increased by talking. After a thorough rinsing of the mouth, its secretions gave an acid reaction. The patient had not suffered previously from any disease of the mouth or throat. The patient was attacked with this only after the lymphatic glands of the neck had become enlarged, and at first, with their increase or diminution the throat affection became worse or better. Finally, under the use of quinia and iron, remedies which exerted a beneficial influence on the entire morbid phenomena, the patient got well. Dr. M. believes that the form of stomatitis and pharyngitis here described is a specific disease resulting from a leucæmic dyscrasy. The inflammation of the mouth, which in its symptoms had a close resemblance to scorbutic stomatitis, was probably caused by an irritation due to some morbid chemical product in the blood and the secretions of the lymphatic glands, by which, also, according to Dr. M., is to be explained the affection of the mouth met with in cases of diabetes, the nature of which is still, however, unknown."

"*Blue Line in Saturnine Affections, and its Pathognomonic Value.* (Archives de Médecine Navale, and Gazette Hebdomadaire.)—Dr. Falot refutes the authors who believe that the blue line along the gums is formed by an accidental deposit on the buccal mucous membrane of lead furnished by dust contained in the air or food, or still more in fluids that have been adulterated or accident-

ally charged. According to M. Grisolle, among others, the blue line is the livery of the lead-worker, not a symptom of poisoning, but a simple deposit, and a sign of the worker's occupation. M. Falot quotes the observations of Beau, Barlow, Gregory Smith, and Lecoq, all of whom observed the blue line in patients undergoing an internal treatment with pills of subcarbonate or acetate of lead; and he gives, in addition, the reports of some cases of his own, which were gathered in an epidemic of colic in a ship's crew at the Gaboon, the cause of which was lead-poisoning. Finally, after having established by experiment the impossibility of reproducing the blue line artificially by touching the gums corresponding to the incisor and canine teeth of the lower jaw with a brush dipped in acetate of lead, and after having proved that oxygenated water, and water sharpened by sulphuric acid, the ordinary reagents of lead, had no influence upon the blue line when it is plainly established, Dr. Falot proves that the line is the result of an elimination of the lead, and indicates by its manifestation that the lead, carried along by the circulation, comes to be deposited in the tissue of the gums, where it forms a combination which reveals its presence by a more or less intense blue coloration. M. Falot finishes his contribution by representing the blue line as a sign of the penetration of lead into the economy, and he derives the important conclusion for forensic medicine, that its presence may denote lead-poisoning, although an analysis of the viscera may not have revealed the smallest trace of the metal."

CHAPTER XX.

CARIES OF THE MAXILLÆ.

Caries of bone is a disease most analogous to ulceration in the soft parts. As the jaws are concerned, it is confined almost exclusively to the superior bones. The causes inducing this condition are of course various; yet dead teeth and roots of teeth will be found far to preponderate.

Caries of the jaw present all the external features which characterize the ordinary alveolar abscess, whether in its acute or chronic forms. This, however, would be inferred, such lesion being so commonly its origin. When the attack is acute in its nature, ulitis or periostitis will always be found associated with it. If the disease originates as a pure ostitis, then the gum in turn quickly sympathizes; if, on the contrary, the inflammation arises from a tooth, periodontitis will distinguish the offending agent. In all inflammations about these parts, whatever their character and cause, the abortive treatment cannot too quickly be attempted. From failure to attack with sufficient vigor such inflammations, I have not unfrequently known the whole bone to be destroyed.

Caries once established, a diagnosis is made easy through the instrumentality of the sense of touch. One or more fistulous openings will be found to exist in the gum, or it may be in some neighboring part; through these sinuses it is only necessary to carry a probe, when the bone is found riddled, honeycomb-like, and easy to break down. In such examinations it always will be found advantageous to replace the ordinary probe with the common dental excavator, as otherwise, from the less accurate touch attained through the first instrument, it may be possible to mistake the denuded bone of ordinary alveolar abscess for the more formidable and extensive disease. In carrying the instrument through the opening of an alveolar abscess, it is remarked that the bone is denuded; but the touch differs from that present in caries, in the fact of this denuded bone being hard and resisting. Not always, however, for it has been just remarked that periodontitis and alveolar abscess are the most com-

mon cause of ostitis and caries, reference being alone had to the pure, uncomplicated cases of alveolar abscess. As a rule, when a sharp instrument introduced can be made readily to pass into the substance of the bone, and to break it down, caries is present. If, on the contrary, the bone is solid and resisting, even although found denuded, caries does not exist.

An ostitis, however provoked, does not by any means necessarily run into osseous ulceration, no more than is ulceration necessarily a result of an inflammation in the soft parts. There are, however, certain individuals, or perhaps it is better to say conditions, which markedly predispose to such ulcerations; of these the strumous is without doubt the most marked. The bones of scrofulous subjects break down easily, also persons who have received the mercurial impression. Cancerous caries of the upper jaw is frequently to be met with; while, aside from such conditions, it has seemed to my experience as true, that in persons of the most robust and vigorous health a slight cause has been sufficient to develop the disease. A case this moment recalled (a very marked one) will serve to illustrate the probability.

In the autumn of 1867 a gentleman from a distant State visited Philadelphia for the purpose of having an opinion concerning a fistule that existed over the apex of the right upper lateral incisor tooth which had long resisted the ordinary applications and injections used by his professional adviser at home. This fistule had originated from the lateral tooth, which was a dead one, and was considered simply an alveolar abscess; the only question thought to be involved being the loss of the tooth, which the patient was most desirous to save. The gentleman coming first under the care of a personal friend, I had an opportunity to see him in consultation, when a thorough examination revealed a softened, honeycomb-like character, not only of the right, but also partially of the left jaw, necessitating an operation of very extensive character, so far as the removal of softened bone was concerned.

In this case I failed to recognize anything wrong with the general health of the patient, in which opinion I was joined by his professional adviser; the person being young, and of more than commonly vigorous habits. The primary lesion was, without doubt, the dead lateral incisor. Why it should have provoked such extensive disease one is at a loss to say.

In this, as in many cases, the disease was developed, and advanced without any very marked acute manifestations, a not un-

common feature in caries, and one which is of much importance to be borne in mind. A whole jaw may be softened and destroyed, while the patient rests under the false impression that he has no trouble that is beyond cure through the loss of a tooth. I have occasionally met with cases of this kind, where even the physician has been alike deceived.

The slowness or the rapidity with which caries progresses is influenced by individual conditions. Thus, in the periods of dentition, it will commonly be found to have rapid progress, unless, indeed, the vital forces are very resisting; while in the mercurially weakened bone caries seems sometimes analogous to a simple mechanical disintegration, as if, indeed, the particles of bone had lost the power of cohesion.

The peculiar affinity existing between this disease and the cellular tissue of the bones leads to the inference that it is more common to persons whose skeletons are loose and spongy in character than to the reverse class,—and this is markedly true; hence strumous children are very subject to caries, as is so often witnessed in their articular complaints.

In many subjects the condition seems to be that of a semi-fatty degeneration, the animal portion of the bone becoming quite soft and greasy; indeed, even the osseous particles thrown off present the same aspect. The relationship of the disease with tubercular deposits is so fully established in the minds of many that they incline to the conviction that such tubercle is present at any and all points of the manifestation of caries. That this, however, is not fully true, is affirmed by examples such as have been alluded to. That constitutional causes have, however, much more to do with the development of caries than local injuries, is sufficiently evident in the immunity of the numberless persons who have been brought, without ill result, under the influences of similar local sources of irritation.

It has been suggested that caries may exhibit itself in various ways. Yet, however and whatever the manifestation, an ostitis must precede the ulceration. About the jaws the great majority of cases have, in their incipiency, nothing to distinguish them from ordinary periodontitis; and it is by far most frequently the case that the acute attack has been long past before this peculiar ulceration is developed, it seeming to be that the resistive power of the bone is gradually worn out by the presence of chronicity; the inflamed tooth has died, and its devitalization is the source of offense. Nearly

every case of caries of the jaws that I have seen could have been aborted by the timely removal of a certain tooth or teeth—not of course all—but that great majority which have had the exciting cause of dental irritation.

A carious bone presents peculiarities according to the duration of the disease and the several phases of causes inducing it. If seen early, there is to be observed simply the increased vascularity and congestion of the inflammation. A little later, and a cacoplastic exudate occupies the cells, which, in their turn, have become enlarged, and their walls softened; these, still later, commence gradually to break down, together with the semi-organized lymph exuded into them; in proportion as such exudation has been, and is, extensive, and the breaking down is rapid, so the caries may be said to be dry or moist; such exudation and degeneration are markedly exhibited in many cases of hip disease, or white swelling of the knee-joint, where the discharge may amount to quite as much as a pint a day. In now looking at the bone, we find it riddled with irregular cavities, many, or all, of which are lined by a sort of imperfect secretory membrane, or perhaps it would be more correct to say, a glazing of organized exudate corpuscles. If the disease is to involve the whole bone, such will be its general condition. If, however, there reside in the part the vital force capable of resisting the disease, then from the center outward will be observed a change in the character of the lymph exuded. The farther we get from the center the more bland and healthy is the exudate; while the complete filling up of the cells exhibits the wall of protection present in circumscribed healthy inflammation of the soft parts. It is to be observed, however, that this protecting wall is most apt to give way before the advance of the disease,—seeming to retard, but not to check it. In other words, nature seems seldom able to complete a line of demarkation, as witnessed in necrosis.

Treatment.—To do all that can be done in these cases is not at all difficult. If inflammation of the bone exists in an acute stage it is to be treated on general principles: cathartics, diaphoretics, counter-irritants, hot pediluvia, leeches, the general abstraction of blood, any or all these means being brought into requisition, the practitioner being influenced alone by the resistance of his case. If a periosteally inflamed tooth be the cause of the inflammation, as is most frequently the case, such tooth is to be removed or treated; generally, however, I think it will be found sufficient to scarify the gums, give a hot foot-bath, apply a blister to the back of the neck,

and administer a saline cathartic. If such a course should not abort, or conquer the trouble, then three or four Swedish leeches may be applied directly to the inflamed part, this being easily accomplished by introducing a napkin back of the middle of the roof of the mouth. If even this should not succeed, and the patient is plethoric, blood may be taken from the arm. It is, however, frequently the case that even what may be viewed as the acute stage will be found of an asthenic type. In these cases, conjoined with the local depletion, tonics will be demanded: iron, quinia, beef essence, cod-liver oil being indicated. If, when a case is first seen, the caries may have become established, as recognized by the existence of fistulæ, the honeycomb bone, etc., vigorous tonic medication, conjoined with stimulating injections, may be tried. Of such injections, the tinct. of iodine, carbolic acid, tinct. capsicum comp., and chloride of zinc, will be found as promising as any. Of the tonics, I presume a common experience will give to the chalybeates the preference. It is not, however, from the medication alone that a cure is commonly to be expected. In caries nature seems unable to throw off the incubus of the disease; and the cases are rare indeed where a relief, by operative means, will not be found imperatively demanded.

To operate for caries of the jaws one seldom requires more than two or three curved chisels, a scalpel, syringe, and alum-water. Taking the fistulæ for the guide, the bone is exposed by a simple incision. Next, with a chisel, suitable in size, the softened bone is, little by little, cut away.

The extent to which caries will occasionally be found to have progressed will be a matter of surprise. One can do no better, however, than follow the softened bone, wherever it may lead. I have very frequently, in this way, been led from an apparent simple beginning, to remove nearly or quite all of the upper jaw. Danger from hemorrhage has not been, in my experience, any special occasion of anxiety; indeed, I fail to recall a case in which the injection of the alum-water has not been all-sufficient for its control. When healthy bone is reached in an operation, it is distinguished from the carious both by the touch and sight. Under the chisel the first is hard and springy, the latter soft and brittle; passing, with the chisel, from the diseased to healthy tissue, one could not fail to remark a difference. To the sight, healthy bone is white and vascular; carious bone is dark and non-vascular, or it is a deadish white, or oleaginous. A very observable difference between caries and necrosis

consists in the absence, in the former, of the odor associated with the latter, caries running its whole course without necessarily giving the slightest annoyance from this cause; at least, where proper cleanliness has been observed.

The use of the syringe, after an operation for caries, is of the greatest moment; the capacity should not be of less than one gill, and every particle of débris is to be carefully washed away. In the after-treatment, this instrument will also be found to perform good service—repeated washings being very conducive to the cure.

CHAPTER XXI.

NECROSIS.

Necrosis, while common to both superior and inferior maxillæ, exhibits the most decided preference for the latter, attacking it perhaps in twenty cases to five of the former. The disease may commence as an ostitis overwhelming the bone in mass, and destroying it. Or, as commonly witnessed, it is produced by a periosteal inflammation, this membrane being separated from the bone by a degenerating plastic exudate. In such inflammations and separations, it would be inferred the layer of bone immediately adjacent to the membrane would be the first to be affected; this is so truly the case that timely incisions and timely combating of the inflammation are most influential in the limitation of the disease. The superior jaw, however, is much more liable to take on a general inflammation than the inferior; but this higher vascularity and susceptibility enables it to resist the destructive action and limit the part overwhelmed.

Inflammation of the jaws, whether osteal or periosteal, are primarily to be treated on general principles. If acute in character we may first try the effect of the hot pediluvia and saline cathartics. These failing, the parts may be well scarified, or leeches may be applied; or blood taken from the arm. Diaphoresis may be employed. In short, antiphlogistics of any and every nature, promising control of the excitement, may be pressed into service. If all, however, should fail, and pus be formed, it cannot too soon have vent given it. When, on the contrary, the inflammation is chronic and asthenic in character, with the necessity for free scarification will exist a demand for local stimulating douches and the administration of tonics. Of the supporting medicines applicable to these cases, the very best I think will be found in the union of sulphate of quinia with the muriated tincture of iron. A combination very frequently employed is as follows:

℞.—Tinct. ferri chl. ℥i;
Quinia sulph. ʒi. M.
Sig. 15 drops in water four times a day for adult.

The most intractable cases of ostitis occur in the periods connected with dentition, whether first or second, the irritability being increased and kept up by the excitability associated with this process. Hence the great amount of care necessary to guard against any increase in the natural vascularity of such age. The trouble aroused, nothing can be done, however, beyond such treatment as applies to ordinary cases; except, indeed, it will be found that there exist a greater necessity for the use of sedative medicaments. Ostitis, or periostitis, of a maxillary bone, like as occurring in other bones, can mostly be traced to an influencing cause; whatever may be this cause, local or constitutional, the primary indication is its removal where possible.

Dental Necrosis.—Dental necrosis, death of the teeth, or death of the neighboring bone from causes associated with the teeth, may claim attention as being the most common of all the troubles of the ossa corpore.

A tooth has a twofold source of vitality—an internal or tubular circulation, secured from its pulp, and an external or periosteal. The destruction of this internal circulation, through the killing of the nerve and filling the root-canal by the dentist, is so common an occurrence as to be familiar to almost every one.

By the majority of teeth, if properly treated, this destruction seems to be sustained without much apparent inconvenience. Such treatment consists in extracting from the cavity every particle of the dead pulp, and so filling it with gold or other material as to prevent the introduction of more irritating matter. When teeth, however, are not properly treated, or when there is great susceptibility in the system to inflammatory action, the destruction of the pulp results in an extension of the destructive action to the peridental membrane, yielding the trouble known as periodontitis; this, if not aborted or resolved, ends in the death of the tooth.

A dead tooth is not, however, fortunately, treated in all cases by the system, or even in the majority of cases, in so summary a manner as a piece of dead bone. As a rule, there exists a wonderful forbearance on the part of nature to its presence, and the organ may be retained in its cavity and made to serve a useful purpose for a long time. True, it is discolored, and, providing there is no decomposing pulp in the canal, in proportion to this discoloration may the degree of death—if I may so speak—be judged. A tooth lowers in the scale of vitality in various degrees. It may be deteriorated as the death of part of its pulp is concerned, or as the death of all of it

is implied—as regards the whole or any part of its periosteum. When both pulp and periosteum are dead, the tooth, of necessity, must be dead with them, and in proportion to their destruction, so is its destruction.

Some systems are so irritable that all the skill in the world could not make the mouths retain a tooth in which alone the pulp is dead. Others, on the contrary, are so unimpressible that half the teeth in the mouth might be utterly dead, and yet no complaint be made. I once, as an experiment, replaced in the mouth a central incisor tooth, which had been extracted twelve hours before, and although it had been carried in the pocket, enveloped in the usual collection of dust, tobacco, keys, knife, etc. the whole intervening time, I kept it in its socket until the parts became reconciled. Many years have since passed, and it seemed to me, when last I saw it, about as useful as in its palmiest days.

The irritation, inflammation, and death of a tooth are generally the result of caries exposing its pulp. The first stage in the destructive process is the death of this part*—here it may end, the pulp sloughing off at the foramen, and the periosteum assuming the full duties of nutrition. If this is not the case, the periosteum becomes involved; if it too should die, the root is left as if scraped; the tooth is then dead. A dead or partly dead tooth is recognized by its loss of translucency, opacity varying from the slightest discoloration to complete blackness.

A dead tooth is not, however, necessarily associated with caries. Inflammation resulting in its destruction, may be induced by atmospheric changes, blows, etc. This should be recognized, so that by reason of the absence of caries a diagnosis may not be obscured.

A dead tooth, when exfoliated, is thrown off in two ways: either by chronic or acute action. When by acute means, violent inflammation is set up in all the surrounding parts, the tooth is elongated and loosened, much pus is discharged, and eventually the tooth drops from its socket; this accomplished, the trouble subsides. In chronic exfoliation, the parts indurate, one or more sinuses form as in abscess, all the parts about the tooth are thickened and rough, as if some ugly disease was in process of development, the tooth generally grows dark, perhaps black. It does not get loose, but frightens

* The pulp of a tooth is composed of most delicate connective tissue, in which ramify the vessels and nerve.

into its removal. If such extraction be not resorted to, the disease involves the bone, and tooth and alveolus become eventually cast off as a common sequestrum. Another, and more common chronic form, consists in the gradual absorption from about the roots of the dead tooth of its alveolar process. This is most common to old persons, although not by any means so confined. This form of exfoliation is usually very slow in its progress, extending over a period sometimes of several years. Cases, however, frequently present—confined to young persons—where several teeth are cast off in this manner within eight or nine months.

Teeth sometimes die from the filling up of their tubules by secondary dentine, the organic function residing in the tubes being thus destroyed. This never occurs but in what are commonly recognized as very dense teeth, and is seldom found associated with caries. Such teeth loosen day by day, and finally drop from their cavities. To arrest this trouble seems impossible. I know of no treatment that has ever seemed to have the least effect.

Alveolar Necrosis.—The periosteum enveloping the root of a tooth is reflected to its alveolus, hence it is commonly termed the "alveolo-dental periosteum." As the result of such relationship of structure, an inflammation originating in a tooth extends itself to the surrounding bone, and according to its severity, affects the parts involved; hence portions of alveolus, overwhelmed, as it were, by the force of the attack, sometimes die and sequester. This form of necrosis, however, is not very common, and would perhaps with proper treatment seldom occur.

The dentist, for the purpose of destroying the pulps of teeth, applies a mixture of arsenic, morphia, and creasote. This is placed in the cavity of decay and covered with cotton or wax; it happens, however, occasionally, that from its improper application, or some difficulty of retaining it in place, this paste oozes down around the neck of the tooth, and thus acts upon parts not intended in its application, inflaming them; in this way alveolar necrosis is sometimes induced: the portion destroyed is seldom, however, very considerable, and generally exfoliates in from two to four weeks. The local application of the sesquioxide of iron has been thought by some to exert a happy effect, applied immediately on the discovery of the accident. Repeated syringings are not to be neglected.

Alveolar necrosis is sometimes induced by the application of chloride of zinc, used by the dentist as an obtunder of dentinal sensibility, and also for the purpose of controlling the slight hemorrhages

caused by the slipping of instruments in the operation of filling; the first effect is of course upon the gum, inflaming and engorging it, the effect upon the bone being secondary. Nothing better than the ordinary antiphlogistic applications can be employed. The action here is much more tardy than in the destruction induced by arsenic, the sequestrum is never very considerable, the alveolus perhaps of a single tooth. The action of nature, in the separation, should always be awaited. Cases of what, for want of a better name, might be termed anomalous, sometimes occur. An instance will illustrate. I. B., an Irish laborer, consulted for pain in the two inferior incisor teeth,—no caries, no periosteal inflammation, nothing indicating disease, was observable; the pain increased day by day, until at the end of the second week the two teeth and their alveoli were found detached, and were dissected from the gum. This case is one of a very few of the kind that I have seen. The nerves are not found dead if examined at such time, as under ordinary circumstances one would so expect to find them; there is no soreness of the teeth on pressure, and, strangest of all, there are none of the common phenomena of inflammation. The practitioner in these cases must be guided by such indications as he may be able to seize upon.

Necrosis from Want of Room for Eruption of Wisdom Tooth.—This most commonly is found associated with the lower jaw. The close relationship of the second molar with the ramus, makes the egress of the advancing wisdom tooth an impossibility; hence an irritation resulting in inflammation. The serious extension of the trouble to the bone is always, however, preceded by more or less trismus and difficulty in deglutition; thus every chance is given for surgical relief. This form of necrosis is to be looked for between the seventeenth and twenty-fifth years. The extraction of the second molar allows the wisdom tooth to fall forward; thus the irritation is removed and a cure effected. These cases are, if rightly treated, as simple and harmless, as they are severe and prostrating if left to chance or improperly managed. Extract the second molar tooth, and do not attempt the removal of the offending one—that is, if such extraction will be found difficult.

Exfoliations of laminæ of bone are very common after the operation of extraction.

Such scales vary in size from that of the finger-nail to a pin's head; they seldom require any particular attention.

Phosphor-Necrosis.—Outside of the association of a patient with

phosphorus, there is nothing which, to an ordinary observer, would distinguish the incipient condition of this loathsome disease from a case of commonly severe periodontitis.

The first sign of a commencing phosphor-necrosis is found in one or more teeth becoming sore to the touch, feeling, on occlusion, as if raised in their sockets; a short time, and the surrounding gum begins to swell: in the character of this swelling is the first distinctive sign. It is not the acute, firm, inflammatory swelling of periodontitis, or ordinary necrosis, but from the beginning has a puffy, debased, and degenerating look. You feel as if you might hesitate in adopting any very decided antiphlogistic treatment, or, indeed, in employing any other than an expectant one.

Phosphorus acts both on the upper and lower jaw-bones, but, according to my observation, seems to have a much more decided predilection for the lower; as nine to twelve, perhaps.

The history of a case of phosphor-necrosis might be epitomized as follows: either from a local or constitutional influence, the latter, most likely, a degenerative inflammation commences in the alveolo-dental periosteum, or in the substance of the bone; I incline most strongly to the belief of its commencement in the latter. The degeneration of this bone progresses until its enveloping periosteum—which remains unaffected, as its vitality is concerned—separates from it. The bones die in bulk or in part. In the lower jaw, the body alone commonly dies, the rami remaining unaffected. In the upper, one cannot well infer where the demarkation will occur. During this process of death, the periosteum, particularly in the lower jaw, is most active in the reproduction of new bone, this new bone enveloping the dead, not, according to my observation, completely, but below and on the sides, making a gutter, as it were, holding the dead bone. The separation of the dead from the living bone, when the dead part is at all extensive, occupies a period of from seven to nine months, and is attended with the formation of many sinuses, both in the mouth and about the neck, being very exhaustive to the patient, both on account of the great suppurative drain and the nauseating character of the discharge. The whole of the soft parts associated with the affected jaw, the periosteum perhaps excepted, sympathize warmly during the process of the dying and separation, looking, indeed, as if very badly affected with scurvy. At the period above alluded to, the separation being completed, the surgeon may remove, with little effort, the sequestrum; the sinuses then heal, and the parts recover with as little deformity as

attends the extraction of the teeth and the ordinary absorption of the alveolar process.

This, I think, will be found the common history of the disease. I have seen and treated many cases, and it is thus that it has presented itself to my observation. I might perhaps add, that the teeth, influenced by the advancing disease, loosen one by one, so as to make necessary their removal long before the bone is ready to come away.

The treatment pursued in phosphor-necrosis consists in the employment of means which shall circumscribe as much as possible the disease, which shall hasten the process of limited death and the accruing separation, and which shall support the patient under the drain to which he is necessarily subjected.

Acting on the impression that there may exist, either in a systemic or local relation, phosphorus, whose force may be susceptible of neutralization, we direct both locally and internally the mineral antacids, —the ordinary magnes. carb. is perhaps as good as any other; a teaspoonful twice each day in a goblet of water. In the mouth, as much as may be laid on a three-cent piece may be used three or four times a day; this local and systemic medication is, by the way, a very admirable prophylactic to unaffected workmen.

When a case presents in its very incipiency, that is, simulating a developing periodontitis, we commence the local treatment just as we would that of the periodontitis. If the inflammation has about it anything of a healthy acuteness, we limit as much as possible all external irritation, by softening in the gas flame or by the stove a piece of gutta-percha, and moulding it over some opposite tooth, or tooth farthest removed from the seat of trouble; a mouthful of cold water hardens this cap, and thus occlusion against the sore tooth or teeth is prevented. A dose of Epsom salts or other saline cathartic is ordered, and a mustard poultice is applied to the side of the face or back of the neck. A hot pediluvium is found sometimes to act very happily as a derivative; or a diaphoretic, such as the spirits of Mindererus, may serve a very good end.

If we first see the case—and this is most apt to occur—when a discharge has made passage for itself by opening through the gum at the neck of a certain tooth or teeth, we immediately make a free incision through the soft parts down upon the bone, and syringe the parts thoroughly with some medicated water, stimulating or antiseptic, or both, as indicated. Having the parts well cleansed, we stuff the wound which has been made with cotton or sponge. This is

repeated the next day and the next, until, particularly as the syringing is concerned, it may be absolutely necessary to repeat it a dozen or twenty times per diem, the progress of the disease being so marked by discharge and offensiveness. As day by day the cotton or sponge stuffing is renewed, it is insinuated gently between the separating periosteum and bone. This manipulation will be found to hasten the separation wonderfully, and expedite the cure of the case.

It might here be asked, perhaps, by some one, "Is not this process of working off the periosteum an unsurgical proceeding, compelling an extension of the disease beyond that which would have been the result if left to itself?" I can only answer from my own experience in different modes of treatment, and say that I am perfectly satisfied that this is not the case, and that the result is for the good of the patient in every way: the portion of bone destined to die has its death markedly hastened; the sooner the death the sooner the separation; the sooner the separation and exfoliation of the sequestrum, the less exhaustive to the system.

The compound tincture of capsicum, with an excess of myrrh and an addition of the permanganate of potash, is an excellent wash for the mouth in these cases. Cold water, with a little common salt dissolved in it, can be used ad libitum.

The sinuses which are so apt to form upon the neck, in defiance of all treatment, and which greatly annoy by their discharge, are most comfortably treated with dressings of patent lint. Once formed, it is a waste of time to attempt the healing of them; they will only get well when the source of offense in the dead bone is removed. I never have been able to heal one before.

It has been remarked that the death is limited in the lower jaw to the body of the bone, the horizontal portion, the demarkation occurring at the angle. This, in the majority of instances, will be the case, particularly if the treatment has been properly directed. Seven months will be found the minimum required for the course of the disease; nine months the more common time; and fifteen the maximum. The drain during most of this time is immense, the patient requiring the most generous tonics and substantial fare. Attention to the repair of this wear and tear is, perhaps, of greater consequence than any local treatment; certainly, if I could not have both, I would think my chances best with the former. To commence, however, with the ordinary medicinal tonics, is ill advised. One cannot keep on forever with them, and by an em-

ployment of them in the beginning of the disease, we lose their powerful assistance at a time when every help is found weak enough at the best. Good underdone roast beef is quite enough for the first two or three months, then an addition may be made of generous malt liquors, together with the salt-bath. The latter portion of the time will demand iron, quinine, brandy. The hemorrhages, sometimes so profuse, are held very well in check by the exhibition, once or twice weekly, of tinct. Erigeron Canadense.

The period at which a sequestrum is ready to be taken away can only be known by repeated examination, the proper treatment being to wait always until the separation is complete, be such time longer or shorter. Nothing, I am satisfied, is gained by expediting the removal through operative proceedings, as by breaking away the bone, using the chain-saw, etc., while the risk to life is very considerable. To wait patiently, keeping the system capable to the demand on it, is the surgeon's highest duty; to do more is to do harm.

The removal of the bone is always to be effected from the inside. I do not think an outside incision will ever be found necessary. If the opening along the gum, obtained in the treatment, is not great enough, it is easily enlarged to an extent desired.

A step preliminary to the removal of the body of the lower jaw, is its division at the symphysis. This is most easily accomplished by means of the straight-cutting forceps. It is better to cut little by little, from above downward, than to crush through the bone with a single cut; it does not hurt or shock nearly so much. The operation is not a severe one, seldom demanding the patient to be etherized, yet it is generally enough to be borne at one sitting.

To take away the bone, I have never found anything better than the ordinary tooth forceps, such as is in common use for the extraction of the inferior incisors and bicuspids. With such forceps, perfect control of the part is secured, and the removal, as a general rule, easily effected.

A trouble frequently encountered, and one which, undistinguished, would prove confusing and deceptive, consists in a grasping of the sequestrum, when extensive, by the lateral overlying tissues—not the new bone, but the indurated soft parts. I recall just now a case which I once had under treatment, where the dead bone being thus held, the physician had been waiting for the separation a period of over two years, being deceived entirely as to the condition of the part. To satisfy one's self as to the state of parts, pass a small hook

under the bone, and lift: if the bone yields springy, it is only thus held, and may with safety be pulled through; if, on the contrary, it is firm and unyielding, it is to be left alone, separation has not yet taken place.

In the reproduction of the new bone, which, at the period for the removal of the old, will be found to have obtained such character as to keep up perfectly the shape of the parts, the observer will be struck with the excess deposited along the middle line of the mouth; it seems as if the floor was a mass of bone, and which, indeed, it really is. Nothing, however, will be found necessary to be done with this excess, nature taking all proper care of it.

Phosphor-necrosis attacking the upper jaw is not, I think, so much to be dreaded as that associated with the lower. It is seldom so formidable in its nature or so destructive in its progress. I have seen the disease in these parts run its whole course with an entire absence of acute action. A portion of bone dies, and the surrounding soft parts seem utterly indifferent. One would scarcely know anything abnormal was going on were it not for the indication given in the loosening of the teeth; these drop out somewhat as they would out of the dried skull. This, however, is, of course, not the common history. The inflammatory action is of the same type as that associated with the disease in the lower jaw, but more limited in extent and consequence, and much more susceptible to remedial measures. A bad feature consists in a marked tendency to recurrence of the trouble, but I believe this will mostly be found to be within the control of the surgeon. I think I am justified in saying I have commonly found it so. The removal of a sequestrum here is a trifling matter, comparatively little dissection letting the piece pass.

At the Medical Congress in Zurich, Switzerland, Professor Billroth, in citing his experience with phosphor-necrosis, remarked that in attacking the upper jaw it seemed to act with greater and more destructive force, and was more unmanageable.

I do not know how to reconcile these differences in clinical observation, unless an explanation may be found in the implied greater tendency to return which exists on the part of the disease, when situated in the upper jaw. In the lower jaw the full part that is to die seems impressed from the beginning,—that is to say, a certain portion seems predestined to die, and it dies in defiance of all you may do. Not that the evidence of the disease is general over all the involved part from the beginning; on the contrary, the incipient

stage is markedly localized; but then, day by day, and week by week, the trouble extends over the apparently predetermined, or pre-impressed, part. When the death occurs, it is a single death, and when the piece is cast off, there is not apt to be any renewal of the trouble. The sequestrum of the upper jaw, on the contrary, is generally small, some portion, most likely, of the alveolar process, but unless the treatment is of the most supporting and specific kind, it is apt to repeat itself, again and again; but your treatment will be responded to here, and thus, with care and attention, you have the amount of destruction comparatively under control. If it is found more unmanageable in Zurich, then the means would not seem to be so well adapted to the end as those here employed, or otherwise the circumstances must be different.

Again, at the same Congress frequent resections are commended. To be so commended, they must, of course, have been found to answer a good purpose. The patients who have their jaws resected for phosphor-necrosis disease in this country generally die, or if happily they escape death, they do not find their disease cured without an inflammatory sequestrum at last.

Fig. 64.—Appearance of Patient with Phosphor-Necrosis.

This case, taken from life, represents a patient as he appeared with the disease five months in progress. At the end of eight months I removed the jaw at the articulation,—the loss was very fully repaired at the date of operation—the parts having excellent motion.

An important objection to the operation of resection, even were

the question of life not involved, is the great resulting deformity. Let nature take her course, and of this there is little or none. My very last patient was a gentleman for whom I removed—or rather waited on nature's removal—the whole body of the inferior maxilla, and I will guarantee that no one could tell whether it had been a case of necrosis or of simple extraction of all the inferior teeth, with the consequent alveolar absorption, so perfect has been the repair in accordance with the destruction. The objection that this new bone keeps up the trouble by becoming involved in the diseased action, is not according to my experience. If it becomes involved, I think it has not been properly cared for. Careful and properly repeated syringings with water medicated with iodine and creasote will protect it.

Syphilitic Necrosis.—The hard palate seems particularly liable to suffer from attacks of specific diseases, the venereal ulcer of the overlying soft parts, and that of the soft palate being observed as among the most common of the constitutional affections. That these ulcers are, however, strictly venereal, I am oftentimes led to doubt; certain I am that they appear and exist, with greatest virulence, where mercury has been used with unnecessary freedom. Venereal ulcers of the mouth are of two kinds: the superficial and the ordinary ulcer of necrosis; either of them being represented in general appearance by the non-indurated chancre. The superficial ulcer may be found both upon the hard and soft palates, but is much more common to the latter. These ulcers—as the chancres—vary in size and character: being sometimes very amenable to treatment; at others, resisting and phagedenic, even to the destruction of the parts. Their treatment is to be conducted on general principles. I know of few surgical conditions requiring nicer general judgment or more attentive care; it is, really, to blow hot to-day and cold to-morrow, and *vice versa*. As a rule, such ulcers are oblong in form, from an eighth to an inch or more in length; more or less excavated, the cavity being filled with a dirty-white semi-solid paste. The truest comprehension of these cases is found, as my experience leads me to infer, in looking at them as one looks at scorbutus.

Touching locally with the acid nitrate of mercury, or with a mixture of equal parts of iodine and creasote, not unfrequently causes them speedily to assume healthy action. I have never seen a case in which the internal exhibition of the mineral acids did not seem to be in some degree useful; and particularly have I found this to be the case where a phagedemic tendency existed. Whatever remedies,

however, be employed, the venereal basis of the trouble is always to be kept in mind. Syrup of the pyrophosphate of iron, conjoined with minute doses of corrosive sublimate and iodide of potassium, will, under certain conditions, compel such ulcers to disappear as if by magic. A combination which may be employed is as follows:

℞.—Hydrarg. bichl. gr. ij;
Potass. iod. ℥ij;
Syr. ferri pyrophos. ℥iij;
Syr. sarsaparilla, ℥v. M.
Sig. Tablespoonful ter die.

The ulcer of necrosis, looking like the preceding, differs from it in having a sinus leading from the pasty mass, which constitutes the apparent bottom to dead or dying bone beneath. The ulcer in this case is not the trouble to be cured,—indeed, could not be cured while the underlying disease existed. Ulcers of this class being an attendant condition, are always situated over bones, generally about the suture of the maxillary and palate bones. They are always preceded by an engorged and tumid state of the parts in which they are situated, indicative of the osseous trouble beneath. The character of this tumidity is always a matter of much concern, as in proportion to its solidity will generally be found the extent of destruction in the soft parts; the variability of this destruction is seldom, however, in proportion to the disease below. I have seen the whole palatine process die while the indicative ulcer has not been larger than the eighth of an inch in circumference; I have, on the contrary, witnessed the smallest sequestrum attended with the largest ulceration.

Incisions into and through this tumid engorgement will always be found satisfactory practice. The cuts, however, are to be made, not carelessly, but with judgment; always taking into consideration the vitality of the part. These incisions, if made through the periosteum, will frequently be found to exercise quite a controlling influence on the ostitis, just as in cases of ordinary necrosis, while the effect upon the soft parts is always for good. The treatment which should succeed the incisions is only to be determined by the circumstances of each particular case; not unfrequently it will be found amply sufficient to keep the parts well cleansed, and await the coming away of the sequestrum; never, however, forgetting to meet the constitutional indication. In other cases, as when, for example, the phagedenic type is assumed, the most vigorous and well-directed

local treatment is necessitated; when cases are first seen in the open ulcerated condition, semi-indolent, as is frequently the case, I know no treatment equal to packing the ulcer with cotton saturated with creasote and iodine. I have had cases come to me for treatment where the bone would be found exposed to the size of a silver three-cent piece, and where all the consequences of a large opening into the nares were to be apprehended, yet, by such an application repeated every other day, allowing the cotton to remain in the ulcer the intervening time, in the course of two weeks the denuded bone has entirely granulated over, and the parts have remained permanently cured.

Breaks occurring in the hard palate, associating the oral cavity with the nares, are easily remedied by a covering of gold or silver plate. An impression of the full roof of the mouth is taken in wax; into this plaster in a cream form is poured; to the cast thus procured is fitted the plate of metal, supported by the teeth, or by atmospheric pressure, precisely as in the case of a plate for the attachment of teeth. Any reasonably ingenious mechanical dentist can meet the indications.

In breaks of the soft palate a simple wad of cotton may be temporarily used with a considerable degree of satisfaction. Astonishing results in the way of diminishing or closing these breaks, both in the hard and soft palates, may not unfrequently be secured by freshening the edges and touching every second or third day with iodine, zinc, acid nitrate of mercury, or the compound tincture of capsicum. Great care is, however, to be exercised in this practice not to overstimulate the parts, very ugly degenerating inflammations being sometimes the result of an overexcitement.

An ugly feature in the syphilitic ulcer is its tendency to recur: a palate, looking healthy to-day, will assume to-morrow an indolent relaxed type, becoming semi-yellowish; some point or other will take on a fatty look, and in a few hours break down into an ulcer. This may recur a dozen times; the explanation is to be looked for in the systemic condition. Such recurrence of the ulceration may extend over a period of six or eight months, in defiance of the most careful attention. I have certainly found it so in my own practice, and imagine it to be a common experience. The salt-bath will be found in these cases invaluable, affording, as it does, an increased vitality.

Exanthematous Necrosis.—Necrosis occurring as a sequel to the exanthematous fevers, belongs, so far as I know, exclusively to the dentitional period. Two cases in my own practice occurred

about the sixth year of age, and were both attendant on attacks of measles. The accompanying view is from a photograph of pieces constituting the full half of the lower jaw, which I removed, some two years back, from the mouth of a little German boy.

FIG. 65.—SEQUESTRUM AFTER MEASLES.

A clinical report of this case, made and published at that time by Dr. H. L. Gilmore, may have, to the student, some instruction in it, as it describes the practice pursued.

"Our first case this afternoon is the little German boy seen by you at a previous clinic. When last exhibited, I told you that we could scarcely hope to save his life, so depressed was his general health; since then, however, a great change is remarked. He has been using salt-baths daily, living on the best and most nourishing food, drinking lager beer, and taking iron and quinine. The parts have been almost hourly syringed, and the offensive and semi-putrid discharge, instead of passing into his stomach, has been kept washed away.

"In the treatment of cases of extensive necrosis like this before us, there are three marked indications. The *first* is to keep up the life-force of the patient. The *second* is to insure against deformity, by securing new bone, to replace the dying. The *third*, to get away the dead bone as soon as nature permits.

"The first and second indications are met on a common principle, namely—constitutional and local tonic, and stimulating treatment. As soon as we see that the death of the circumference of the bone is not to be avoided by that preliminary treatment, which applies to the demands of the inflammation in its acute stage, we at once apply ourselves to saving the periosteum by a process of enucleation. We introduce, as rapidly as we can, tents of cotton and sponge between the bones and periosteum, which, by their expansion, effect the end desired, hasten necessarily the death of the denuded bone, and preserve for the repair the osteo-genic power. Here will be found exhibited the necessity for great cleanliness, and not unlikely for local stimulation. Permanganate of potash, from 3 to 5 grs. to the

ounce of water, will be found an admirable disinfectant. Tincture of iodine, or the tinct. with a small addition of creasote, is the best stimulant I am acquainted with; I think the latter will provoke the periosteum to effort when nothing else will,—at least this seems to be my personal experience.

"As a rule, I think new bone can be made to envelop the old; but there are cases where such a result cannot be secured. Such a case is the one before us. I have done everything possible for this boy, but there is no attempt at repair. An explanation is to be found, of course, in his general condition; he is a very scrofulous subject. His necrosis is the result of an attack of measles. The removal of the dead jaw must, of course, to some extent deform him,—that is, if we are not mechanics enough to invent some antagonizing piece of apparatus, to be worn until a cure is effected. If the boy was able to bear a longer drain upon his system, I would leave the dead bone, and continue to try to get the envelope of new bone; but this would not do, the drain must either cease, or the lad must die. The effort to secure new bone could only be continuous of what I have been doing, and it really would seem as if it were useless to do in this way more than has already been done.

"I cannot learn, with any positive certainty, exactly how long this disease has been going on; the parents say several months. If you get such a patient cured within a year you will have managed your case very well,—the rule always being to wait for the reparation of the bone, hastening and advancing the exfoliation by any non-operative means in reason, but never anticipating the natural cure by section with saw, knife, or chisel.

"Having then done for this boy all in our power, and having, as the result, a dead half-jaw, which, from the irritation kept up by its presence, is day by day injuring him, there is nothing left to be done but its removal, and this I will now proceed to effect in your presence.

"When I touch the bone with a probe I recognize it as dead bone. Dead bone has a peculiar feel when struck: it emits a dull leaden sound, has a rough surface, and can be recognized as being more or less necrosed. When, however, the lower jaw-bone is dead, and is not enveloped by a gutter of new bone, it is found held very firmly in its place by the surrounding indurated soft parts. This is oftentimes a source of great deception, leading to the injurious inference that the bone is not exfoliated, and as a consequence, permitting its undue retention. This is the condition in the present case. To

satisfy myself, I introduce this delicate hook beneath the bone. In lifting with it I find the bone yields with a kind of spring, as if I were pulling against cartilage. This satisfies me that the bone is loose, and needs only to be freed from this indurated ring to be capable of a comparatively easy removal. We will now etherize the boy, and lay this ring open as far as the coronoid process. Not forgetting, however, in the incision, the relation of the internal carotid artery to this process. . . . . .

"The bone extracted included both the coronoid and condyloid processes, and the body as far forward as the incisor tooth.*

"After the operation, there was directed one-eighth of a grain of acetate of morphia. Lead-water and laudanum to the face, and frequent syringings with medicated water."

Other Exanthems.—Necrosis from other of the exanthems I have not personally happened to meet with, although from scarlet fever it is much the most frequent; while, as well, a reasonable number of cases are reported from smallpox. From measles I have had three cases.

Mercurial Necrosis.—Ostitis, and exfoliation from the undue use of the mercurials, are so common as to have been observed by every practitioner. The history of each case is that of a progressive pytalism: first, the coppery taste, enlargement of the tongue, salivation; second, soreness of the teeth, recession and loosening of the gums, discharge of offensive pus, exfoliation. Many interesting cases of this condition have come under my own notice, some of which are alluded to in other parts of this volume. Generally, the cases will be found associated with children, induced by the great vascularity and susceptibility of the bones at the dentitional period. I judge, from my own observations, that a practitioner in the use of this medicine must look, for a rule of practice, in every individual child he may have occasion so to treat.

In the treatment of mercurial ulitis, I have called attention to a practice by free scarification and the local use of iodine. Many cases of threatened necrosis have been by these means aborted, but very great care is to be exercised that the low vital force be not still further depressed. (See *Chapter on Ulitis.*)

The treatment of ulitis is the treatment of ostitis.

In the special treatment of a sequestrum, it is to be looked

* Two years later I saw this patient—the deformity was very trifling, and he certainly seemed to use his jaw without inconvenience.

upon as a matter of much importance that the dead piece be detached by nature alone, assisted by the surgeon only as in other paragraphs described. Particularly does this seem important in the young jaw, as thus it may happen that we shall not disturb, unnecessarily, the germs of developing teeth.

Much stress has been laid by some practitioners on the preservation of such teeth as are associated with the sequestrum, and advice given that incisions be made through the soft parts that shall allow the bone to be drawn away from the loosened teeth. Such treatment can certainly only apply to very few and peculiar cases. As a rule of practice, I am confident it must be found of little signification.

CHAPTER XXII.

THE TUMORS OF THE MOUTH.

In entering on a consideration of the tumors of the mouth and jaws, we are to recognize and appreciate certain general governing, or underlying principles.

1st. Tumors of this location, alike with those situated in other parts, are analogous and heterologous, or benign and malignant.

2d. The maxillary bones, because of their great vascularity and exposure to sources of irritation, are, perhaps, more disposed to enter on pathological conditions than any other of the ossa corporæ.

3d. The principal source of irritation to the maxillary bones is to be found in diseased teeth.

4th. Malignant tumors of these bones are perhaps to be esteemed only as local exhibitions of an existing cachexia. The character of the diseased action, the result of local injury, will be determined by the diathesis.

5th. Tumors of the maxillary bones which may, with most assurance, be looked on as benign, are the encysted, the common inflammatory, and the exostoses.

6th. Those, the character of which may be esteemed doubtful, and malignant, are the sarcomatous—fibro-plastic—and the carcinomatous.

7th. There is not, unfrequently, such a running together, so to speak, of the appearances presented by benign and malignant growths as to render distinctive diagnostic signs only appreciable, if indeed, at all so, to the very experienced. Certain general features, however, associate commonly with the two lesions, which are to be studied with the greatest advantage.

1. Benign tumors, it will be found, are mostly to be referred to some cause, and are apt to be in proportion to this cause. They are found circumscribed by healthy structures, lymph in a greater or lesser state of organization surrounding and marking their line of extent.

2. They do not seem to have other than the most innocent rela-

tion with adjoining organs, any disturbance of function from their presence being referable to mechanical rather than to pathological causes.

3. In structure they are found homologous; they represent more or less truly the parts to which they are allied, and possess scarcely any other than a single formative capacity. They do not defy constitutional treatment, but are more or less influenced by it. If removed by the knife, they do not return.

1. Malignant tumors are, on the contrary, not at all in proportion to a cause which may seem to be the provocative. They are not healthily circumscribed, but their elementary particles are most apt to be found infiltrated, inserted, or diffused in the interspaces and cavities of the tissues in which they lie. They are associated with a cachexia which is not unfrequently more marked than the local disorder. Thus the vis vitæ is not unfrequently so prostrated that the patient is found dying with systemic depression. (The common idea that the cancer patient has the color of a cold buckwheat cake is not entirely without truth; it is not always seen, but, I believe, exists in a proportion of cases.)

2. A marked diagnostic sign (perhaps the most marked) of a cancerous tumor, is the effect of its presence on surrounding glandular structures; these becoming enlarged and indurated, and remaining so.

3. The removal of any supposed cause, or the removal of a cancerous tumor itself, will not effect a cure.

4. True cancer seems not amenable to any constitutional treatment. There are, I think, the best of reasons for inferring that all reports of cases cured have originated in mistaken diagnosis.

5. Malignant tumors have, through the cachexia, a varying formative capacity: they multiply, and, as it were, propagate themselves; if one is removed, a second comes to take its place, either appearing in the site of removal or in some other locality.

In the study of these marked and distinctive features, the practitioner will find himself led to perceive the first and most important of the differences in maxillary tumors; he will be led also to appreciate the fact of a relationship which is to compel him to look on certain of the homologous growths as not being entirely devoid of danger; he will also find data for judgment which will serve him in every individual case.

Benign Tumors.—For convenience of study, we will class under this head the cystic growths, the common inflammatory, and the

exostoses, premising that, as the first class is concerned, we shall have occasion further on to recognize exceptions.

Cystic Tumors.—The cystic tumors of the mouth are of two kinds: simple and compound. The simple cysts seem to be mere expansions of the outer plate of the bones—wind-bags, as the older writers called them; a fair expression to convey the idea of their character, yet requiring considerable qualification. The second class, the compound, are cysts containing peculiar contents, which contents have induced the cyst and constitute the lesion to be studied; of the latter class, the odontocele is by far the most common, and such tumors vary from the simple encystment of a perfected tooth to some perverted development which requires the nicest discernment of the microscope to investigate. Under the head of cystic tumors might also, with propriety, be noticed those occasional expansions of the walls of the maxillary sinus dependent on engorgements.

The Simple Cyst.—All writers on surgery have remarked the existence, in the mouth, of this form of tumor. A simple expansion of the bone with varying fluid or gaseous contents; different authors differently describe and name them. The term spina ventosa is, perhaps, about the most unmeaning that has been applied. As I *know* them, their history may be written as follows: there is first remarked on the side of the jaw, either superior or inferior (no preference seems to exist), a slight flattened enlargement; this increases slowly, until the swelling reaches the size of half a hickory nut; they are seldom seen larger. No pain attends the growth, and outside of the mental disquietude necessarily induced, no functional or other constitutional disturbance attends. The slowness of growth is such that it requires from one to three years to reach the size alluded to. This tardiness, absence of pain, and constitutional disturbance constitute marked diagnostic signs. Another sign, and one on which every writer with whom I am acquainted lays particular stress, is the giving forth, on pressure, of a parchment-like crackling; with this last I seem, however, to have had a peculiar experience, for while I have treated quite my share of such cases, it has not been my fortune to find such crackling sound in any single one of them, and while of course it would ill become any individual to assert that such a crackling never can be heard, yet I would impress that such a sign is not by any means an ever-present indication, consequently is not to be given the heed demanded for it. In most of these tumors on which I have

operated, septi, more or less in number, have been found supporting the vault; with the existence of such pillars it is plainly enough seen that yielding would be out of the question, so that the practitioner is not to be deceived by the firm character of the tumor. The gum covering such cystic tumors is always perfectly normal,—no congestion, nor anything indicating its implication; a matter important to observe, as, should the diagnosis be in anywise obscured, the practitioner would have, at least, the satisfaction of feeling a tolerable assurance as to the benign character of the growth as well as to its non-acute character.

Of the number of cysts of this class that I have seen, every one have been situated in the outer or vestibular walls of the bones. Why they should be so, or indeed whether it is always the case, I do not know. I only offer my own experience.

A diagnosis made out, the cure is very simple. A common treatment, and one generally practiced, because of its little trouble, is to make a crucial incision through the body of the tumor, and, breaking up such septi as may exist, stuff the cavity with lint saturated with the tincture of iodine; this, if there is no foreign body in the cavity, as, for instance, the root of a dead tooth, will invariably cause the base to throw out granulations, and thus obliterate the cyst.

Another mode not unfrequently resorted to, is to dissect from the tumor, in flap-form, the overlying gum, and with a chisel cut away the vault of the cyst; the parts are then carefully syringed and the flap laid back. This latter operation requires much more time, much more skill, and gives much more pain. The first is not nearly so objectionable to the patient, and is equally as effectual.

Concerning hemorrhage, little anxiety need be felt. I never found it give any trouble; it may be necessary to syringe the cavity with a little alum-water, or some other astringent, but even this is not commonly needed.

Case —. Mrs. C——, aged about twenty-one, applied to me, some two years back, for treatment of a tumor occupying the canine fossa of the left superior maxillary bone. The growth had been eighteen months in progress; was about the size of half a walnut, perfectly solid to the touch, painless, and entirely healthy-looking; the greatest disquietude of the patient being mental, her mother having died from scirrhous cancer.

Diagnosis —Simple cyst.

Treatment.—Crucial incisions were made; several delicate septi

of bone, which the cuts discovered, were broken up; the cyst was injected for the first three days with weak stimulating liquors. No inflammation developing, tufts of cotton were saturated with tinct. of iodine, and the cyst stuffed. In one week the site of the cavity was occupied by healthy granulations; in three weeks the patient was entirely cured, and left the city for her home in an adjoining State.

Case —. About nine months back, a German woman applied with a cystic tumor, similar to the above; it was certainly as unyielding as solid bone. This tumor was treated by making a crucial incision through the soft parts alone, the flaps were dissected off, and the cyst being exposed, was cut away with a chisel-shaped instrument. The flaps fell naturally into the cavity, and were left, even without a stitch, to take care of themselves. The cure was complete in about a week.

There is a tumor of the soft parts of the jaw—cystic, but not osseous—which is not to be confounded with the class just described. Both look, occasionally, precisely alike, but the latter yields under pressure, as any tumor of a semi-soft part would yield. Mr. Paget alludes to such a disease in his lectures on Surgical Pathology, pages 342–3. "A woman," he says, "thirty-eight years old, was under my care in 1849, in whom, at first sight, I could not but suppose something was distending the antrum, so closely was deformity of the face due to such disease imitated. But the swelling was soft and elastic, and projected the thin mucous membrane of the gum of the upper jaw, like a half-empty sac. I cut into this sac, and let out nearly an ounce of turbid, brownish liquid, sparkling with crystals of cholesterine. The posterior wall of the cyst rested in a deep excavation on the surface of the alveolar border of the upper jaw; an adaptation of shape attained, I suppose, as the result of the long-continued pressure of the cyst, which had existed six years."

Mr. Paget also makes mention of a young man under his care with a similar tumor, which, he says, was the result of an injury to the gum or alveolar border six months previously. In neither of these cases, says he, could I find any disease of the maxillary bone.* Their origin, so far as my experience goes, is in a diseased tooth-fang.

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* These cysts I have several times met with. They are what may be termed cold, or non-acute alveolar abscesses.

I do not know what so close an observer as Mr. Paget means when he says he could find no disease of the bone. There ought to be at best one little shotlike hole somewhere about the surrounding osseous wall; at any rate, such is the history as I have met with them.

A succeeding case, which Mr. Paget mentions, seems to prove the tumors are the same as I refer to. "A lady," he says, "had a small cyst of this kind, which had existed twenty-seven years, filling and discharging almost daily. It had its origin in a blow, by which the two median incisors were loosened."*

A few winters back a physician from Kentucky applied to me for treatment of a tumor of the lower jaw, which had existed for over two years; it had the feel of a fibroid body. This gentleman, with the imaginative qualities common to the practitioner, when he himself becomes the patient, had succeeded in satisfying himself of the cancerous character of his trouble. An incision through the growth demonstrated it to be a cold alveolar abscess. In a single week he was cured; the treatment required was, simply keeping patulous the incision, and using a few stimulating injections.

In the *Western Medical Journal*, vol. x. pages 185 to 228, is a learned article from the pen of Prof. Gross, on "Excision of the Maxillary Bone." In the course of this paper, he makes the following allusion to the osteoid cysts:

"The sero-cystic tumor of the upper jaw is uncommon, and, fortunately, devoid of malignancy. Its usual site is the alveolar process, where it has been known to attain the volume of a hen's egg, and even of a large orange. It is composed of a thin, semi-transparent, or slightly opaque bag, occupied by a colorless or sanguineous fluid, or by a glazy, mucilaginous substance. Sometimes, though rarely, there are two such cysts, either closely connected together or separated by a kind of osseous septum. The bone around the tumor is expanded into a thin, elastic, crackling, parchment-like shell, and is easily penetrated by a sharp instrument, the puncture giving vent to the characteristic contents of the cyst." This, Prof. G. thinks, is the best diagnostic sign of the morbid growth. "The general health," he remarks, "remains unaffected in the disease, which is always tardy in its progress, and manifests no disposition to extend among the adjacent structures." Where any doubt exists as to the real nature of the case, he advises a resort to the exploring needle, which he says will usually at once dispel it.

* This history is that of chronic alveolar abscess in every particular.

Prof. G. thinks it is not often this tumor calls for removal of the affected bone; he gives it as his experience that, in general, it will suffice to puncture it occasionally with a small trocar, to evacuate its contents, the escape of which, he says, he has found to be often followed by the rapid contraction and final obliteration of the sac. Where there is a strong tendency to reaccumulation, he recommends that a large opening should be made, and tincture of iodine thrown in, to promote the object in view.

The cystic tumor of Paget is, I presume, the same disease of the jaw to which the name spina ventosa was originally applied—spina to express pain resembling the pricking of thorns, and ventosa to indicate that the tumor was filled with wind. The term is not yet obsolete, but, like epulis, is employed so freely that no one now knows what it means.

Recapitulatory.—The cystic tumor is an osseous cyst of the jaw, which forms just beneath the outer plate of the alveolar process, and has its cyst as a result of the expansion and attenuation of the external lamina.

It is seen as a bulb on the alveolar face, is commonly met with about the size of half a hickory nut, the gum which covers it is perfectly natural in appearance. It may yield to the touch, or it may not.

The most satisfactory, and, withal, perfectly safe means of diagnosis, is to pass a keen scalpel or lancet into the growth; if it is the tumor we describe, the knife will give to the touch the sense of having passed through a bony wall into a cyst.

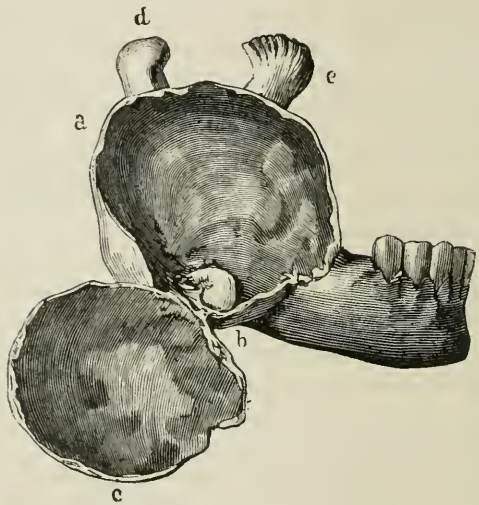
The septi, alluded to as existing in the simple cysts, are occasionally replaced by what is known as a multilocular cyst,—that is to say, a common tumor is made up of many cysts. As these cysts increase in number, so the complexity of the tumor increases; and it may be that we will feel ourselves compelled to decide that a cure is best promised by the complete extirpation of all the portion of bone implicated.

Examination will reveal that these cysts vary much in character; sometimes they will be discovered unlined and empty, sometimes a kind of serum will be found to fill them. Again, as in a case operated on by myself, they will be found filled by a pulpy, liver-colored, turgid, lining membrane. This is the class that affiliates with what is to be described as cysto-sarcoma; as these tumors pass from simplicity in their expression, we come to class them with the latter disease, and to esteem them as belonging to

doubtful growths. It has been my experience that as such tumors increase in complexity they discolor the overlying mucous membrane, so that as this membrane is changed, we judge the growths allied to cysto-sarcoma.

The Compound Cyst.—In this class of the cystic growths we have the running together of the benign and malignant conditions which make so necessary to their proper appreciation that general comprehension of the subject alluded to on a former page. Without doubt the dentigerous cyst is by far the most common type of the compound oral cystic growths; but in the malignant cysts teeth are sometimes found, or some dental association is seen to exist;

Fig. 66.—Odontocele.



hence, not to confuse the subject in the outstart, we are to understand here that in the use of the term compound cyst, we mean benign cysts which contain irregularly-developed teeth or dental tissue.

A common odontocele is the simplest form of an osteo-dental tumor; it may present itself in any part of the maxillary structure, and what is of much consequence to remember, may have, as the primary lesion, a supernumerary tooth.

Illustrations.—A young lady, aged sixteen, presented herself, having a tumor, intramaxillary, evidently, occupying the anterior left side of the hard palate. Her exact condition is as follows: she

has never had a single tooth of the permanent set extracted. Yet she lacks, to make up the complement common to her age, the canine of the affected side. The tumor is, of course, an odontocele, or at least so great is the probability of such being its character, considering the absence from the dental arch of the tooth, that any surgeon would feel justified in founding a proposed operation on such conviction.

In 1861 the following very interesting case of odontocele came under my observation. The patient, desiring a set of artificial teeth, had, about a year previous, had extracted all the teeth of the upper jaw, and, as is customary, had been dismissed for a period of some four months, not desiring to wear a temporary denture. At the end of this time the impression of his mouth had been taken, the parts being in a good healthy condition. The teeth were made, placed in position, and worn with entire comfort for a period of several months.

About eight weeks before presenting himself to my notice, these artificial teeth were found to be getting loose, as if from some projection at the right border of the myrtiform fossa. Applying to his dentist, surprise was expressed at the occurrence, and advice given that the further progress of the case should be awaited. At this period the gums were more or less congested, and were putting on quite an angry appearance; a few days later a fistule formed. His dentist, confident that no portion of the roots of any of the teeth had been left in the alveolus, now dismissed the case, advising him to seek surgical assistance. In this condition he came under my observation.

The case presented the following features: much engorgement of all that portion of the gum and lip covering the incisive and canine fossæ, and which extended in a triangular direction to the inner canthus of the right eye, much soreness on pressure over all the affected parts, the fistule discharging thin, and occasionally bloody pus.

Examination with the probe gave the impression that it struck against the root of a tooth, and which would certainly have influenced the making up of the diagnosis if experience had not assured me that no tooth could, under ordinary circumstances, have had a fang extending such a length.

Deducing from the conditions present the imperative necessity for an operation, and the patient willingly acceding to the conclusion, the followimg course was pursued. The patient was etherized; an

assistant, having sponge and water at his side, took charge of the lower jaw and lip. A second assistant steadied the head and held the superior lip well out of the way of the knife.

The parts being thus very fairly exposed, a pointed and somewhat delicate-bladed bistoury was passed through the superior fleshy boundary of the canine fossa to the inner canthus. To my surprise, it passed not only through the soft parts, but in the return cut sunk readily into the bone. A first flap was now dissected posteriorly from the dead mass: a second was bounded mesially by the nasal bone, ala, and left prominence of the myrtiform fossa. The blood being sponged away, I discovered, lying in the very center of the carious bone, a cuspid tooth of ordinary size and development, the apex being in immediate relation with the floor of the orbit.

That this tumor had existed for a long time is not of course to be doubted, but it excited the attention of the patient only on the setting up of acute inflammatory action. This inflammation soon destroyed the integrity of the vault of the cyst; hence the softened carious state in which I found it. The interest associated with the case lies in the absence of all the teeth, and the consequent loss of data for the diagnosis.

Osteo-dental tumors dependent on the development of supernumerary teeth are quite common; they are generally easily recognized from their position and size, being never larger than an ordinary pea, and mostly situated in some part of the palatine processes of the superior maxillæ. Any obscurity, however, in these tumors is readily dispersed by thrusting a bistoury or exploring needle into them. The dental surgeon particularly would remark from the sense of touch whether or not the contents is tooth substance.

Osteo-dental tumors not unfrequently have as their contents undeveloped teeth. Only a few days back I saw a couple of bicuspid crowns, evidently long dead, which had been removed from one of these oral compound cysts.

Such osteo-dental tumors, then, as just illustrated, may be viewed as the most simple of these compound cysts. Another class, the complex osteo-dental cyst, may now claim attention. No better illustration of this class of tumor can be found on record, perhaps, than in the memoir of the Guadeloupe banker's son, by M. Forget, presented to the French Academy, and so ably and happily republished in English some years back by the publishers of the *Dental Cosmos*. As the illustrations and text are still in possession of the

journal, the reader interested in the subject cannot do better than give them most attentive consideration, while certainly I cannot do better than by using them. We preface by remarking, that by a complex osteo-dental tumor we mean a cyst containing some complex mass, which common observation, or the microscope, reveals as being made up of irregular developments of dental tissues.

Observation.—1. *Osteo-Dental Tumor, size of a large Egg, encysted in the thick part of the Inferior Maxillary—Ulcerous Inflammation of the Parietes of the Cyst—Numerous Ossifluent Fistulæ—Resection of the left half of the Body of the Jaw and a portion of its Branch—Cured.*

Early in May a banker, of Guadeloupe, introduced to M. Forget his son, whom he had brought to Paris with the intention of subjecting him to the necessary surgical operation for the remedy of a disease of the inferior maxilla, which had made its first appearance when the patient was five years old.

History of the Disease.—At that period (five years), young L. suffered from pains in his left jaw; they were for some time intermittent, then continuous and acute. When the patient was seven years of age, two small healthy molars were extracted, under the impression that they were preventing the evolution of the second teeth. The operation gave great relief, and the pain ceased; but shortly afterward a small, round, hard tumor appeared on the external face of the jaw, near the alveoli of the teeth that had been removed. The tumor caused no suffering to the patient, and made no sensible progress for a period of eight years. The whole of the left side of the jaw then became tumefied, and the bone, in the language of the patient, broadened and rounded. He also observed, at this time, that the large molars, which were regularly developed on the right side, were wanting in the diseased part.

This morbid enlargement was accompanied by frequent fluxions of the gums, cheek, and whole left side of the face. The recurrence of this fluxion was attended with great pain, and caused an increased tumefaction in the soft parts to such an extent that the difference between the sides of the face became absolute deformity.

In November, 1854, a violent inflammation occurred in the base of the jaw and the cervico-maxillary region. Antiphlogistic treatment was employed, two applications of leeches were made, and the inflammatory symptoms decreased, and, fifteen days afterward, purulent matter formed in the thick part of the cheek, which opened spontaneously, allowing the issue of a large quantity of fetid pus.

The opening of the abscess became fistulous, the surrounding tissue then detached, and, under them, the bone was naked for a very considerable extent.

Present Condition.—Young L., aged twenty, strong, well developed, with an excellent constitution, and health perfect in all respects, excepting the local affection.

The disease appears externally in a considerable tumefaction of the left cheek, which is more than three times its natural size, and the tumor has caused a very marked eccentric development to the corresponding maxillary bone.

When the patient opens his mouth, which he does without effort, the whole left side of the bone was seen to resemble a large turkey-egg—the base of the jaw being confounded, without appreciable line of demarkation, with the internal and external faces, which describe a very considerable curve.

The tumor is uniform, without depressions or any irregular swellings upon the surface. It does not yield to pressure, and no part of it gives that sound of crepitation which is characteristic of attenuation of the osseous tissues. The external swelling hides the superior and lateral part of the neck; the enlargement of the bone has forced the tongue from its true direction, and the floor of the mouth has been driven from the left to the right.

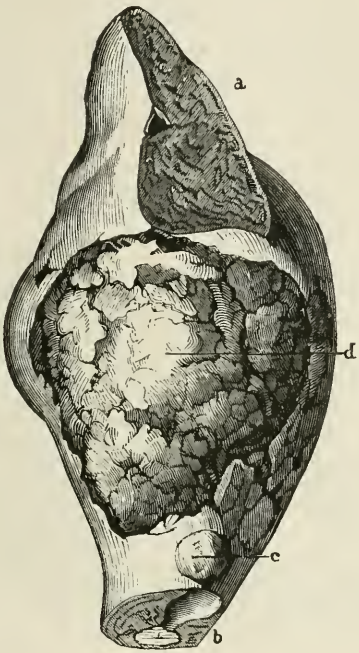
The alveolar ridge, singularly enlarged, contains none of the grinding teeth, except the first bicuspid, which stands regularly in its socket. The tissue of the gums is dark-red, and unusually thick and hard. In a circumscribed spot, about the size of a twenty-centime piece, the tissue is broken, and exhibits an unequal, wrinkled, grayish surface, which gives a dry sound when struck with a metal, as if the crown of a tooth were hidden in the cavity.

In order to complete the symptomatic description, it is added that there are many ossifluent fistulous openings at the base of the tumor, and much hypertrophy and hardening of the submaxillary lymphatic ganglion.

The functional disorders arising from the pathological condition, at first very slight, are noticed at this stage as increasing every day: embarrassment of vocal utterance, mastication painful and incomplete, deglutition effected with difficulty, and respiration very difficult every time inflammation is renewed in the tumor; lastly, the patient suffering from two serious inconveniences—one, the very marked deformity of the face; the other, the incessant flow of fetid pus, proceeding from the complicated fistulæ of the osteo-dental caries.

M. Forget here describes the operation, the usual resection. One incident, however, should be remarked: in making his anterior cut with the chain saw, he alludes to coming in contact with a tooth placed horizontally in the thick part of the bone, precisely under the alveolus through which he was cutting.

Fig. 67.

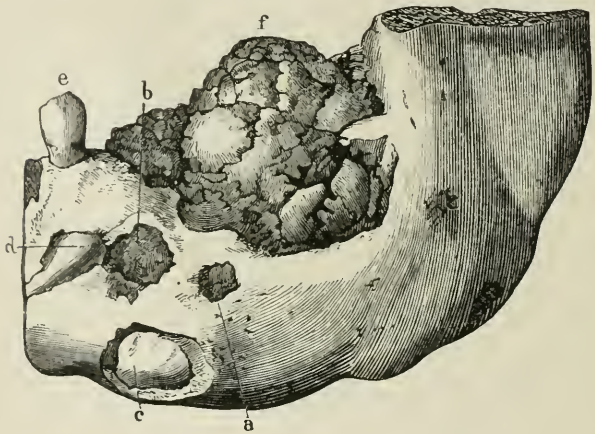


Anatomical Examination of Tumor.—With the surrounding soft parts, it is described as being an exact ovoid. The soft parts, adhering to its external face, were found marked with many fistular passages, ending at inflamed and ulcerous points of osseous tissue. This tissue was thin, soft, and depressible, and perforated by two orifices leading into the interior of the cyst, from which exuded a purulent, viscid, reddish liquid. A stylet introduced into one of these passages was stopped by a hard body, which, under percussion, sounded like a compact tissue deprived of its periosteum. This object was reached by dissecting off the gums, which, condensed into a thick bed, formed a sort of operculum for the upper part, completing the cyst in which the morbid product was situated. The dis-

section exhibited that the jaw from the ramus to the premolar had been changed into a cavity containing a compact, saxaform, ovoid mass, the size of a large egg, grayish, unequal surface, studded with small tubercles, surrounded by a bed of enamel, and completely buried in the thick part of the bone. (See Fig. 67.)

Next, the tumor was divided along its axis into two unequal parts, each confined to the corresponding half of the osseous cyst that was comprised in the division. This revealed the composition of the tumor: it was formed of a smooth, glossy, compact, homogeneous, ivory-like tissue, of a whitish-brown color. In the center of it a kind of regular disposition of its elements is described as existing, discernible by the naked eye. (See Figs. 68 and 69.)

Fig. 68.

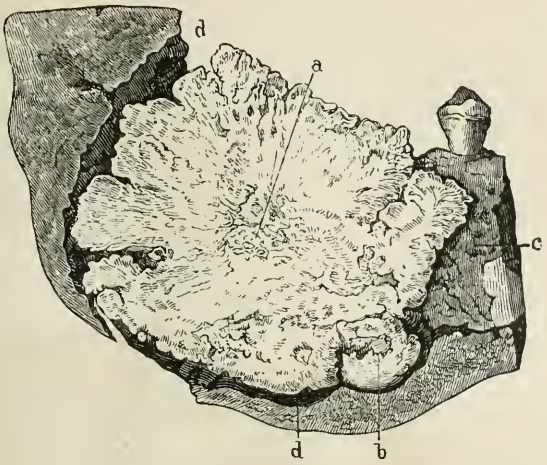


Between the tumor and the wall of the cyst was a thick, fibro-cellular tissue, free on the side of the former, where it covered the whole intramaxillary portion, and was joined to the latter by filamental prolongations of a cellulo-vascular appearance—these being attached to the numerous openings that covered the face of the cyst. The external surface of this membrane was bathed with a muco-purulent liquid, smelling like dental caries.

At the base and anterior extremity of the tumor, an indentation is described fitting the crown of a large molar that stood between it and the maxillary bone. (See Fig. 69, *b*.) A portion of the same tooth caused a slight elevation on the external face of the jaw. (Fig. 68, *c*.) M. Forget also describes the tooth encountered in the oper-

ation. (Fig. 68, *d.*) Its location, as will be seen, is directly beneath the alveolus of the first molar, which is standing in its true position. (Fig. 68, *e.*)

Fig. 69.



All the teeth, with the exception of the last two molars, it will thus be seen, were found, and the space appropriated for them was filled by the tumor. What, then, queried M. Forget, could have become of these two great molars? It could not be, he argued, that the bulbs, compressed from their very origin, had disappeared without leaving a single vestige of their existence. The numerous instances, he held, that had occurred of the simultaneous development of teeth and anomalous productions in the very center of the maxillary would not allow him to think of accepting such an explanation. In all the analogous cases that had fallen under his observation, the teeth were of the ordinary dimensions, and complete in number, although removed from their normal position, and sometimes buried even in the morbid substance itself.

Let us now, that we may fully comprehend such a class of cases, pursue the study of this particular one.

Fig. 67 represents the left half of the body of the inferior maxillary bone, hollowed into a large cavity, containing an ivory-like, bony tumor.

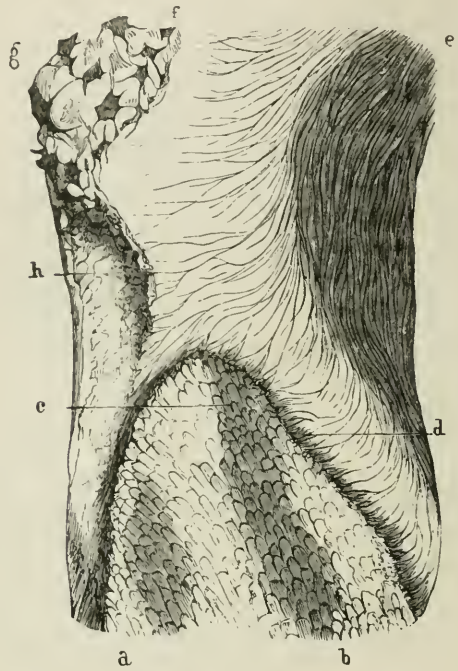
d. Side view of the alveolar edge.

a. Orifice of the dental canal upon the surface of the resection of the bone in the continuity of the ramus.

b. Plane of the cut in front, showing the second small molar which was found in it.

e. Crown of the first molar, in regular position.

FIG. 70.



Figs. 68 and 69. The two halves of the anatomic section, divided according to its axis (osseous cyst, and included tumor).

Fig. 68.—*c.* Crown of great molar, seen through a notch in the outer wall of the cyst.

d. Second small molar.

e. First small molar.

a and *b.* Points of the same wall, perforated by the prolongation of the tumor.

f. Summit of the most elevated of these.

Fig. 69.—*a.* Interior aspect of the tumor.

b. Great molar inverted.

c and *d.* Cellulo-fibrous membrane, interposed between the osseous cyst and tumor.

Fig. 70. Microscopical examination.

M. Forget, in presenting this case to the French Academy, remarked that it was a duality of anatomical and pathological lesion, so rare, that after the strictest research, he was led to believe it unexampled in the human species. Thus, then, we have here, side by side, each extreme, and understanding each, there is not likely to come anything between that we may not be able readily to explain.

A dental germ assuming, or compelled to an abnormal position, may have various sequelæ. It may make a maleruption; it may remain encysted; it may die after partial development, or it may heterogeneously develop.

We have then but to consider heterogeneous development, and we have mastered the pathology of the lesion, and all its various phases.

First, let us dissect a tooth—for the parts of a tooth are the parts of such tumors. A tooth is made up of enamel, dentine, cementum, pulp substance, and peridonteum.

Enamel of the Teeth.—Cortex strata, adamantina dentium; crusta dentium adamantina; substantia vitrea.

The enamel of a tooth is that portion which caps the crown. In structure it is fibrous; its fibers radiating from the center to the surface.

In microscopic structures, the enamel (Owen) consists of long and slender, solid, prismatic, for the most part hexagonal, fibers of phosphate, carbonate, and fluate of lime; which are essentially the contents of extremely delicate membranous tubes.

Dentine.—Os dentis, substantia ossea ebur dentis. This is the portion of the tooth between the cementum and enamel and between the pulp and the enamel. It makes up the great body of the organ. Dentine is composed of numberless tubules, these being not larger than the one ten-thousandth of an inch in diameter; their course is waving, each tubule having several curves resembling, according to Retzius, the Greek letter ϑ. "Professor Retzius confirms the observation of Müller, that the tubes contain an organic earthy matter in granular masses, which disappear under the action of dilute muriatic acid. The cells, and the small tubes which radiate from them, also contain earthy matter, as in bone. They are naturally white and opaque; but, after maceration in dilute muriatic acid, become colorless and transparent."

Chemically, dentine differs from enamel principally in the absence of the fluate of lime.

Cementum—Crusta Petrosa.—The cementum of a tooth is that

portion which invests the fangs. In character, it corresponds quite closely to the osseous structures. The microscope demonstrates clearly the existence of Haversian canals, and the so-called corpuscle of Purkinje, or, as Robin prefers to term them, osteoplasts.

"In growing teeth, with fangs not fully formed, the cement is so thin that the Purkinjean cells are not visible; it looks like a fine membrane, and has been described as the periosteum of the fangs, but it increases in thickness with the age of the tooth, and is the seat and origin of what are called exostoses of the fangs, which are wholly composed of it." "It is the presence of this osseous substance," says Professor Owen, "which renders possible many well-known experiments of which the human teeth have been the subject; such as their transplantation, and adhesion into the combs of cocks, and the establishment of a vascular connection between the tooth and the comb," etc. Under every modification, the cement is the most highly organized, and most vascular of the dental tissues, and its chief use is to form the band of vital union between the denser constituents of the tooth, and the bone in which the tooth is implanted.

Dental Pulp.—The pulp is that vascular, reddish-gray, highly-sensitive substance, occupying the cavity of the tooth. It is made up of delicate connective tissue, in which ramify the dental nerve, artery, and vein.

"When," says Mr. Nasmyth, "the internal structures of a dental pulp are examined, the number of minute cells which present themselves in a vascular form is remarkable; they seem, indeed, to constitute the principal portion of its bulk." Mr. N. describes them as "varying in size, from the smallest microscopic appearance to one-eighth of an inch in diameter; and as being disposed in different layers throughout the body of the pulp." This tissue is highly endowed, and, perhaps, more liable than any portion of the body to take on morbid action; fungoid degeneration is, perhaps, its second most common disease.

Periodontal Membrane.—This is the periosteum of the tooth. Anatomically and physiologically it differs little from this general class of membranes. Pathologically, I think it may be remarked as being more susceptible to disease, and more disposed to assume quickly the acute conditions. For example, inflammation of the periodontal membrane is easily provoked, and, once inflamed, it is ever after surprisingly prone to reassume morbid action. Again, we need only call to mind its epulic outgrowths; the frequency and varied character of these growths.

Familiar with tooth structure, we turn to Fig. 70, as referred to, and trace a perversion of development in all these structures; see them forming a tumor, strictly dental, yet to the last degree anomalous and abnormal.

We return now to the microscopic examination of tumor, made by Professor Ch. Robin. Fig. 70 (400 diameters). This figure represents a portion of a slight cut made into the tumor represented (Fig. 69, *a*).

The preparation is taken from near the free edge, or the irregularly mammillated surface of the tumor. The latter is formed principally of the ivory or dentine, easily recognized upon the thin section by its very fine tubes, disposed in parallels, or nearly so, through part of their extent (Fig. 70, *e*).

These tubes, radiating more or less regularly from the little depressions or cavities observable in the mass of the tumor (Fig. 69, *a*), very near to each other through part of their extent, these tubes of ivory become more rare, fine, and ramified as they approach the surfaces of the dental tumor (Fig. 70, *d*, *f*), and end in a very sharp point toward the lines of junction between the ivory and the enamel (*a*, *b*, *c*), and the cement (*f*, *g*, *h*). The presence of the ivory, which forms the greater part of the tumor, demonstrates its dental nature very clearly.

Enamel.—Another important particular is the presence of the enamel on the surface of the tumor, where it, in some measure, covers the irregularities with a varnish which moulds itself upon them in order to penetrate more or less deeply into the fissures or depressions that divide the tumor superficially into lobes.

This bed of enamel varies in thickness from microscopic dimensions to a millimeter (·03937 inch), or near it, and is as irregular in places on the lower or adhering face as it is on the free surface, which the microscope alone allows to be seen. The portion of the section of the tumor that is here delineated (Fig. 70) is taken at the level of one of the points where the enamel (*a*, *b*) in a manner penetrates (*c*) into the body of the ivory mass of which the tumor is principally formed.

The enamel is easily recognized by its narrow prisms, from six to eight-thousandth of a millimeter in width, which are in immediate juxtaposition (Fig. 70, *a*, *b*). The figure shows them inclined, as by the accidents of the cuts in making the section. When the cut is perpendicular, or nearly so, to their greatest axis, their prismatic form, with five or six faces, is easily seen; this is shown in the neighborhood of *b*, Fig. 70.

Cement.—In the depth of the fissures, and here and there in the mass of the tumor, near its surface, and especially that part of the surface hidden in the adventitious cavity of the maxillary bone, the microscope discovers some trails or beds of variable thinness, formed entirely of the substance of the cement (Fig. 70, *g*).

The cement is inclosed between masses of ivory, and is consolidated by the immediate contact (Fig. 70) with the masses between which it lies. It extends itself in places with the surface of the tumor to the neighborhood, and even to contact with the enamel. The section represented in the plate is taken at a point that shows this arrangement (Fig. 70, *f*, *g*, *h*). There are, besides, thin pieces of cement extending far forward into the body of the tumor.

The cement is known to be no other than the osseous substance. The figure before us exhibits the characteristic elements belonging to it. These are the microscopic cavities, called osteoplasts, or, incorrectly, osseous corpuscles, for they are excavations. The air that fills the dry bone makes these cavities appear black under the microscope (Fig. 70, *g*); but, in the fresh state, they are full of liquid, and are pale and more difficult to observe than in the dry pieces.

These cavities, which are, in breadth and length, from one to three-hundredths of a millimeter, are always of very irregular shape, on account of the presence of the fine tubes that start from all their peripheries, and traverse even the substance interposed between the osteoplasts.

The best joined pieces show that these little canals are subdivided two or three times, and are then inosculated with those of neighboring osteoplasts. The portion of cement, shown in the plate, does not exhibit this arrangement, which was visible, nevertheless, in the parts close to it.

The cuts in the tumor exhibit, moreover, little openings, that are either full or empty, of a grayish or brown pus. These small orifices are from two to six-tenths millimeter and upwards in width, and from about one to two millimeters apart. The microscope shows that these orifices accompany the narrow, irregular cavities, sometimes in the form of elongated conduits, hollowed out of the ivory which they pass through. The instrument also shows that the tubes of the latter start from these cavities to radiate toward the surface of the tumor, in the same manner as the tubes of the ivory in the normal tooth start from the natural cavity of the dental pulp. These narrow, irregular cavities, more or less elongated, traverse the

mass of the tumor, and some of them even reach within a few millimeters of the surface.

These cavities are, in reality, nothing more than the pulp cavities of this morbid product, either rugous from desiccation or still containing some remnant of the dried pulp in the form of a brownish or grayish powder.

RECAPITULATION.—The result of all these observations of the case is thus epitomized by M. Forget.

1st. An original union of the follicles of the last two molars followed by an intimate union of them, caused by phlegmasial or other actions.

2d. Under the same morbid influence, the excess of vitality in the organic elements of the follicles has produced hypersecretion of an ivory-like osseous substance.

3d. That the irregular aggregatism and diffusion of these constitutes the pathological growth.

4th and lastly. Its growth has formed in the cyst, and it has maintained therein a permanent inflammation which has disorganized the osseous tissue and altered the structure of the adjacent soft parts to such an extent that a radical operation was necessary.

Thus we have studied the extremes: a simple cyst, with a tooth in it, and a tumor so complex in character and structure that no one but the microscopist might hope to be able to recognize it. Yet these tumors, differing so widely in their features, are alike in the most important one of being benign. Their prophylaxis is the same, and for a good distance their surgery runs side by side.

Dental tumors, intermediate to these two classes, are of various features. But, with an ability to recognize the dental elements—with an understanding of the minute histology of enamel, dentine, cementum, and pulp substance—what difference can it make, having eyes and a microscope, how these elements aggregate?

I once saw a tumor taken from the maxilla, which looked like a mass of ivory; it was quite as large as two of the molar teeth put together. I need scarcely say that it was two of the molars; their germs had in some way affiliated, and, remaining encysted, had produced this abortion. The microscope revealed very distinctly the tubulated character of the mass; this pronounced it dental quite as satisfactorily as though the shapeless lump had been moulded to the tooth-form.

I have had shown me, as great curiosities, teeth with ivory masses

projecting at right angles from their crowns. I never, however, have seen this anomaly where it was not plainly evident that the projection was a twin tooth—the result of germ union;—there would be a tooth missing in the arch.

Many curious illustrative instances could be mentioned of anomalous incongruities in dental evolution; but, as we are prepared to understand, we would find them in character the same—enamel, dentine, cementum, and pulp structure. The arrangement only would be found to differ; with our eyes, or assisted by the microscope, we could or should be able to say of any of them, This, and this, and this is dental.

The ability, then, to distinguish a dental from a malignant osteoid tumor, must certainly prove a source of much satisfaction; for, as M. Forget curtly remarks, if intervention cannot be too radical in an instance of cancer, it is certain, on the contrary, that more caution and moderation are necessary when it is a question of a lesion, which is essentially local and of a benignant nature, and allows the surgical operation to be restricted to the precise limits of the lesion, without its being necessary to provide against an improbable repetition by encroaching upon the osseous tissues that border on it, and thus subjecting the patient to a mutilation which could not be justified.

Data.—1. There are twenty teeth in the deciduous denture, which twenty are to be replaced by thirty-two, each of which is to be at least twice the size of its predecessor.

2. A contracted maxilla, having no accommodation for certain teeth, the germs of which are in the jaw, gives us, among other lesions, irregularity in dental evolution.

3. Irregularity in evolution yields morbid conditions, as described, and which conditions are influenced, not unlikely, by peculiarities of the general organization and manner of interference with development.

4. An overcrowded arch will surely yield periodontal and other minor troubles, and may produce lesions of grave character. The extraction of certain of the bicuspidate teeth of the permanent set should, therefore, be practiced, whenever time shall make evident the existence of contraction on the part of the arch.

5. Dental tumors vary from simple cystic growth to such perverse and anomalous evolutions, that the microscope only is capable of explaining them.

6. A dental tumor is an abnormal growth, having its point of departure and development in irregularity of dental evolution.

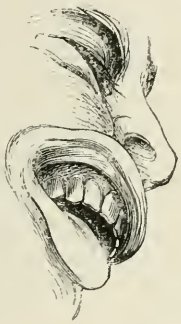
7. Dental tumors are benign; operations for their cure promise all success, and may be practiced in exclusive consideration of the disease as it locally exists.

8. The existence of a dental tumor is to be inferred, *cæteris paribus*, when there is deficiency and derangement in the dental arch.

CYSTIFORM ANTRA.

Fig. 71 represents a cystic tumor, or, rather, expansion of the walls of the antrum, as occasionally met with. The cyst represented in the view occurred in the person of a young gentleman some twenty years of age, from whose jaw I removed it two years

FIG. 71.—ANTRAL CYST.



back. This cyst, the size of an ordinary orange, was successfully treated without external incision, the soft parts being dissected off by pulling outward and upward the angle of the mouth; the wall of the cyst, about the thickness of ordinary parchment, was cut away with a chisel. This particular cyst was without contents of any kind. After the removal of the vault the soft parts were permitted to fall into the cavity of the sinus; no deformity at all resulted, and no trouble has since been experienced.

An interesting feature in this character of cases is found in the tenacity on the part of the antrum, after operation, to maintain its cavity. I have tried my best to obliterate this sinus by compelling granular activity in its mucous membrane, but so long as I have been enabled to watch my cases, and in one that I recall, seven months elapsed before the overlying tissues so covered in the part as to conceal it from observation; in none of them have I been able to satisfy

myself as to what was the subsequent condition of the sinus; my impression is, however, that the mucous membrane maintains itself, and that a species of cavity continues to exist.

Hydrops antri is another form of cystiform enlargement of this cavity. The dilatation in these cases is gradual and painless, and when the bone becomes expanded to any considerable extent, fluctuation is commonly apparent, the vault of the cyst yielding readily enough to pressure. If any obscurity exists, it may be removed by the use of the exploring needle. It sometimes happens, in these cases, that the floor of the orbit becomes the yielding point, or it may be the canine fossa, the tuberosity, or the hard palate; the latter boundary, however, according to my observation, is the most frequent seat of the enlargement forming the tumor within the mouth.

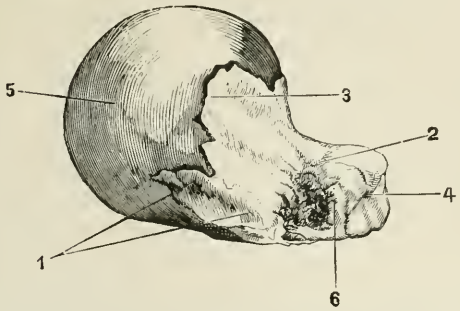
Hydrops antri depends, in many cases, on the formation of a cyst within the cavity. In others it may be viewed as a simple mucous engorgement, the natural outlet into the meatus being, from some cause or other, obliterated. A very expressive illustration of the first of these conditions was exhibited in a specimen taken by myself some three years back from the antrum of a young man. In this case the cyst seemed to spring from the root of the second molar tooth, or its immediate neighborhood; the mucous membrane had been dissected up, and covered the cyst as a reflex tunic. Although this particular tumor was not large enough to exhibit external evidence of its existence, yet there are no reasons for inferring that such tumefaction would not eventually have resulted. A case of interest, in this direction, is recorded in the practice of Dr. Chase, of Iowa City, who reports it in the *Dental Cosmos*, accompanied with diagram.

Description of Case.—"An Irishwoman, aged forty years, came to have the right first upper molar extracted. I found her teeth in a bad condition generally: they were decayed and loose, and the gums congested. This particular tooth was decayed and very loose. On pressing it, the alveolus seemed to move with the tooth. Adjoining it in front, was the root of the second bicuspid—the crown gone.

"As she was of that class who make no attempt to preserve their teeth, I extracted the molar without hesitation. She had told me that her 'jaw' had ached for three or four months previous to this time. On applying the forceps, the beaks readily passed under the gums without lancing, and the tooth, much to my surprise, came away with a very slight application of force. But this surprise was

not equal to my astonishment, when I saw what I had brought away with the tooth, namely, a large quantity of alveolar substance,

FIG. 72.—SECONDARY CYST OF THE ANTRUM.



1, root of second bicuspid attached to alveolus; 2, neck of tooth and border of alveolus; 3, walls of antrum, palatal side; 4, center of crown of tooth; 5, tumor; 6, tartar, covering the cavity of decay. The buccal aspect of the tooth was similar in appearance to the palatal surface which is seen in the engraving.

the bicuspid root, and a fibrous connective tissue tumor, nearly an inch in diameter, attached to the tooth, and inclosing two of the roots, namely, the posterior buccal, and the palatine roots.

"After being in alcohol three days,* the tumor was nearly white, and had shrunken to one-third its original size. On cutting it open, it was found filled with a solid structure. The consistence was that of tubercle, or pressed cheese-curd; the color, light yellow, tinged in most parts with red.

"The roots within the tumor were nearly free, and covered with their periosteum, which had thickened into a loose, spongy mass, extending even to the base of the body of the tooth. The appearance was like that of roots involved in alveolar abscess. The walls of the tumor were not composed of detached dental periosteum. There were apparently two coats, the outer, fibrous, like periosteum; the inner, a mucous one, like the lining of the nasal cavity."

The pathology of the case, as inferred by Dr. Chase, is, that the tooth decayed to the pulp cavity, that the pulp, after repeated inflammatory attacks, died. Putrefaction of that organ occurred, provoking periodontitis; after awhile suppuration occurred, and the disease became chronic. The periodonteum became thickened and spongy, continued irritation caused a proliferation of connective

* It is to be regretted that an examination had not been made at once.

tissue corpuscles, thus eventuating, finally, in the formation of the cyst.

This inference is, I think, the true explanation of the cyst; the trouble, however, was seated primarily on the bicuspid and not the molar roots—involving the latter secondarily. This tumor, although it possessed not the contents of the one operated on by myself, yet has a similar pathological signification: it constitutes a most instructive study.

In cases of this kind it will be seen at a glance that, however patulous the natural outlet might be, the contents of the tumor could not by such means find egress. In the second character of cases, the contents are just within the cavity, but the engorgement of the tissue bounding the outlet has closed the foramen. A case described in the chapter on Diseases of the Antrum exhibits the dangerous and destructive effects of such accumulations when unappreciated and untreated.

CHAPTER XXIII.

EXOSTOSIS AND SUBACUTE INFLAMMATORY TUMORS.

The term exostosis, as the reader will recall, is derived from the expressive roots εξ, out of, and οστεον, a bone; an osseous tumor which forms at the surface of bones, or in their cavities; the first is called exostosis, the latter enostosis.

The following varieties have been named: "ivory exostosis, that which is ivory-like;" lamina exostosis, that which is made up of distinct fibers or layers; spongy exostosis, that which is like the spongy tissue of bone.

Hyperostosis is precisely the same thing as exostosis, both being inflammatory hypertrophies. Inflammatory osseous tumors are hyperostoses.

Because, however, there are great differences in the expression of these conditions, I shall write of them under special heads.

Exostosis, as commonly met with in the mouth, is strictly benign. It is generally recognizable by its extreme slowness of growth, the entire absence of pain,—except when it meets with some peculiar obstruction,—and its freedom from surrounding disease. It does not tend markedly to ulceration, and does not, except mechanically, affect the parts even most directly associated with it.

True exostosis has its origin in local irritations, perhaps always. It is true that reference is made by authors to an ossific diathesis, but, as truly remarked by Miller, "A skeleton so susceptible is prone rather to the more common inflammatory products of caries, abscesses, ulcers, and necrosis."

That local irritation is the chief cause of exostosis is satisfactorily proven, I think, by reference to parts most subject to this interference. The teeth, for example, are found exostosed in a thousand instances to one of any other bone, and certainly no bones are so constantly found in irritative conditions. I use the term "bone," reminding the reader that the portion of the tooth which takes on this morbid action is almost, in every proper sense, true bone.

Non-specific exostosis, occurring on any portion of the maxillary

bones removed from the alveolar borders, is an exceedingly infrequent affection. With every opportunity for observation, I am surprised at the fewness of the cases I recall ever to have seen; and most of these have been small, and of little consequence.

Around the base of the alveolar processes, however, and particularly on the lingual aspect of the lower jaw, this affection, in a minor form, is exceedingly common; certainly I have seen hundreds of examples, the enlargements varying from the size of a small shot to that of a rifle-ball! As pathological relations are concerned, however, they seem of little consequence; I never knew one to result in any harm; the treatment I have adopted in such cases has been the very simple one of letting them alone.

It is not improbable though that cases may present when operations seem demanded. I have felt called to operate upon some two or three of such as I have met with. The mode of procedure is simply to lay off from the tumor the soft parts, and, with a chisel, cut away the mass; there is no hemorrhage or other trouble attendant on the operation. (See *Hyperostosis.*)

Exostosis of the fangs of the teeth—exostosis dentium—the usual seat of the disease in the maxillary regions, finds location both in the cemental and dentinal structures of these organs; for while I have seen two or three cases where the crowns of the teeth were enlarged, as if from a species of exostosis or hypertrophy, yet these were so anomalous that I may describe the growth as being associated exclusively with the fangs; and even here, I think, it will be found in the majority of instances confined mostly to the apex, growing, bulblike, as it were, about the end of the root.

The diagnosis of exostosis in these situations is not by any means easy. The most frequent pathognomonic feature, however, is a sense of continued uneasiness about the parts, not generally amounting to pain, but serving as a constant reminder of the presence of the tooth. The tooth itself may or may not be carious. Pressure, or the stroke of an instrument, does not, in ordinary cases, either increase or diminish the soreness; the sense of fullness about the parts is particularly observed where the absorption of the alveolus is not proportionably active with the exostosis. In these latter cases, the extremest symptoms of neuralgia are not unfrequently produced, and which, not comprehended, are of course treated without avail.

One of the most remarkable cases of dental exostosis on record is related by Mr. Fox. The subject was a young lady, who, at the time she sought the professional aid and advice of Mr. Fox, had suf-

fered so severely and so long that the palpebræ of one eye had been closed for nearly two months, and the secretion of saliva had for some time been so copious that it flowed from her mouth whenever it was opened. She had tried every remedy which had been recommended by the ablest professional advisers, without realizing any permanent benefit, and was only relieved by the extraction of every one of her teeth.

The practitioner may infer from the mention of this case that he is likely to meet with many gradations of the trouble. The cure will consist in the removal of the affected member: this, after the diagnosis, is always easily accomplished with the aid of a pair of cutting-forceps.

In the venereal, scorbutic, and tubercular hypertrophy or exostoses of the maxillary bones, the features of the common disease become quickly evident in the local trouble, so remarkably so, indeed, that no one would be at all likely to misunderstand things, presupposing the general disease be understood. The growths are rapid, painful, and always more or less amenable to constitutional treatment.

Scrofulous and scorbutic tumors differ from the venereal in being more loose and spongy in structure, and, in consequence, more apt to run into abscess, being possessed, as it were, of elements for their own destruction.

In these forms of maxillary disease, the lesion is commonly heralded by deep-seated, dull pains, which precede by some time the visible enlargement of the part. After the tumefactive process once sets in, it goes on, if uncombated, until the parietes of the bone are completely disparted. Associated with this enlargement is an unhealthy condition of the soft parts.

As the disease advances, the center of the tumor softens, while the character of the pain changes, becoming sharp and throbbing; as pus forms, sinuses are created, and thus ulcerations occur on the face of the tumor.

The treatment of inflammatory tumors of these and similar types is to be conducted in consideration of their twofold requirements. The systemic influences are to be corrected, while locally, I think I am justified in asserting that, as a rule, they will succumb to the treatment commonly directed against similar abscesses of the soft parts. I have great confidence in the use of tents and stimulating injections.

There is a simple inflammatory tumefaction of the maxilla some-

times met with, which might be mistaken for specific exostosis. It is to be distinguished, however, by the greater rapidity of the swelling and by the greater soreness attendant on it; it comes, as a cold in the head, or on the chest,—comes without, in the majority of cases, the patient being able to assign any cause, and it is found soon to give way to the same class of antiphlogistics. This tumefaction is extra rather than intramaxillary; it is, more than likely, a periosteal exudate; it has, of course, no constitutional associative lesion.

In this connection, attention may be directed to a form of tumor frequently found in the mouth, and which, I think, is pathologically classible with the exostoses. I allude to an apparent expansion of bone frequently found in association with a strumous diathesis, and so invariably in connection with periosteally diseased teeth or roots of teeth; not always, however, are these expansions or growths in association with the strumous condition, as I have often enough treated them in individuals whose constitutional conditions seemed perfect.

These tumors have a common history. The nerve of a tooth dies and the periosteum takes on a chronic irritative condition, or perhaps a tooth has been fractured in attempts at extraction, and the root, or some portion, has been left in the socket. After a time, sooner or later, a slight swelling, apparently of the gum, is observed. This may readily enough be taken for a chronic alveolar abscess; there is no pain, however, associated with the enlargement, which is soon seen to differ from the abscess in the slowness of its evolution; it is also hard, and perfectly unyielding under pressure. As we watch the case month after month we find it gradually enlarging, giving to the observer the impression of an expansion of the bone under the gums, although, as we understand, there are no special or marked signs of such cystiform condition. If we pass an exploring needle into the tumor, it feels as if cutting its way through spongy bone; and so indeed it does, as dissection will reveal to us that the cancellated structure has taken on hypertrophic action, and it is such spongy enlargement that bulges out the overlying parts and makes the tumor. I have treated a great number of these growths, and invariably in connection with the inferior jaw. I do not think they would often be found in the superior, such chronic conditions being here more apt to induce caries, which disease we know to be as uncommon to the lower as it is common to the upper jaw. These tumors, so far as I have seen, have no

tendency to take on malignant action; they either remain fixed in character, after growing to the size of a half walnut, or, in very bad subjects, they degenerate into abscess, and, discharging the offending body, cure themselves. Such spontaneous cure is, however, very rare.

The surgical treatment of these tumors is both simple and effectual. It is enough, not unfrequently, to remove the tooth or root, particularly if, in connection with such removal, we keep the socket open for a few weeks with a tent of cotton or sponge. A very certain method, and one which I am in the habit of employing in my own practice, consists in cutting away, with a delicate gouge, the enlarged mass: this is easily enough accomplished by using the opening made in the extraction of the tooth as a means of ingress to the mass; it can in this way be cut out, piece by piece, without any external incision, and with a wound not larger than that made by the preliminary extraction. After such operation the parts are to be well syringed and a tent kept in the tooth-socket to insure granulations from the circumference of the wound. In two or three weeks the cure will commonly be found complete.

In this connection I may call attention to an obscurity which sometimes seems to exist in the diagnostic relationship of diseased teeth,—that is, no teeth or roots of teeth may seem to be present. A sufficiently close observation, however, will always detect in the neighborhood a fistulous opening; it may be very minute, but it is seldom, if ever, absent. If a probe be passed into this orifice it will lead to the offending agent.

HYPEROSTOSIS.

In connection with the simple tumors, reference may now be made to general facial hyperostosis sometimes existing. In a work lately published by Mr. Heath, being the Jacksonian prize essay for 1867 of the Royal College of Surgeons, England, the following illustrative diagram and description of case are given:

The patient, when about forty-five years age, and apparently in perfect health, was exposed to a cold wind; immediately after which he perceived an itching and heat in his eyes, and swelling of the face rapidly supervened. A small tumor formed just below the inner angle of each eye, which burst, and after twelve weeks he was able to resume his employment. He suffered from inflammatory attacks in the tumors, with much pain in the head on more than one occasion, and consulted many medical men; but no treatment re-

lieved the disease or retarded the growth of the tumors, which increased slowly, and were of stony hardness. The eyes were projected from the orbits by the tumors, and the right eye inflamed and burst, while the left was accidentally ruptured by a blow. The patient

Fig. 73.—Hyperostosis.

lived to over sixty years of age, and died of apoplexy, having been occasionally maniacal during the last two years of life. The portrait is taken from the work of Mr. Howship (Practical Observations on Surgery). The skull of the patient is preserved in the College of Surgeons, and shows, as might be anticipated from the portrait, two large masses of almost exactly symmetrical form and arrangement, which have partially coalesced in the median line. The growths are as hard as ivory, and consist of very close, cancellous structure. They project more than three inches from the face and an inch beyond the malar bones on each side. The man attributed the growths to repeated blows received on the face in fighting.

The skull of a Peruvian (3093 College of Surgeons) is also alluded to by Mr. Heath. In this case the disease is of a more diffused character, all the bones of the face, as well as the frontal and the adjacent parts of the sphenoid and parietal, being enlarged and thickened in a remarkable manner. The nasal fossæ and orbits are nearly closed, the superior maxillary bones having grown into great knobbed and tubercular masses, in which their original form can hardly be discovered. The hard palate is similarly diseased. The lower jaw is enormously enlarged at its right angle, and in the greater part of its right half it measures upwards of five inches in circumference, and all but three of its alveoli are closed up. A

section of the lower jaw shows that its interior is composed of an almost uniformly hard and compact, but finely porous, bone. There is no history attached to the specimen.

Hyperostosis is simply exostosis or enostosis. It is analogous to hypertrophy of the soft parts, and must have a similar history.

As can be very well understood, varieties in form and character present themselves. These growths are sometimes associated exclusively with the face of a bone, as in the ordinary exostosis. In these cases the periosteum may separate the two bodies. In other cases there is hypertrophy of the bone proper. The condition is one of disease only as there is a lack of correspondence in other parts. Any section, as in a specimen in Dr. Gross's collection, exhibits the peculiar features of bone substance; it may be that the cancellous substance is compressed into solidity, but there is the demarkation between it and the cortical boundary, and the analysis remains the same,—that is, as the constituent parts are concerned. When these hypertrophies associate exclusively with the endosteum, as in the long bones, they obliterate or diminish the medullary canal, and, if of sufficient size, expand into a tumor, greater or less in size, the external parts.

The history of any form of hyperostosis is the history of certain of the phenomena of inflammation; there is, from some cause or other, irritation attended with vascular changes, the effusion of plastic matter succeeded by the osseous. What this source of irritation is, and how to control it, are matters, unfortunately, too often beyond our conceptions.

Reference has been made on a preceding page to the hypertrophies of the specific conditions; such enlargements are easy enough to understand, even if not so easy to remove; but the hyperostoses here considered are not of such character, but seem to be of an entirely local signification; hence a local source of offense may not be sought for in vain, as, for example, in Mr. Howship's case, where the ostitis might very plausibly be attributed to the blows received. The inflammatory thickening of bone, alluded to a few pages back in connection with diseased teeth roots, is but another exhibition of the results of local irritation.

That the hyperostoses are to be viewed, and in every way treated, as simple overgrowths, is certainly well exhibited by Mr. Quekett, who, submitting to microscopic examination portions of all the osseous tumors in the Royal College of Surgeons, confirms the position in all particulars. The rates of the growths of such tumors

are, I presume, influenced by individual susceptibilities or peculiarities; there is certainly in this respect the greatest possible difference. In the Osteographia of Mr. Cheselden is the engraving of an osseous tumor surrounding the head of a tibia, which measures exactly one yard in circumference. An imposing case is also figured in Mr. Paget's Surgical Pathology.

In this growth, as Prof. Clark describes it, the hardest parts have neither Haversian canals nor lacunæ. In the less hard parts the canals are very large, and the lacunæ are not arranged in circles around them, and everywhere the lacunæ are of irregular or distorted form.

Fig. 74.—Osseous Tumor.

The above remarkable specimen of an osseous tumor of the left upper maxilla, from the Traité de Pathologie Externe, found in the Musée Dupuytren, is described in Mr. Heath's essay as being limited behind by the pterygoid process, internally by the intermaxillary suture, above and externally by the malar bone. The tumor encroaches considerably upon the cavity of the mouth, and reaches back as far as the front of the spine. Its form is bilobed, and in the deep sulcus between the lobes can be seen a molar tooth. All the other teeth of the jaw have disappeared, and there is no trace of their alveoli. The left orbit and nasal fossa are not sensibly diminished in size, but the cavity of the mouth is almost entirely occupied by the posterior lobe of the tumor. The lower jaw has, in this case, undergone several remarkable alterations. It must at first have pressed upon the growth, and produced the deep sulcus between the lobes; but in its turn the tumor has reacted upon the lower jaw with the following effect: it has caused a double luxation of the jaw, the left condyle resting against the root of the zygoma, and the glenoid cavity being filled with soft material. The teeth of the left side of

the lower jaw have disappeared, and absorption of part of the coronoid process and the whole of the alveolus has taken place, so that only the base of this part of the bone is left. The outer surface of the tumor is smooth, and presents numerous vascular grooves of good size; at many points it is perforated with holes. The vascularity of the other bones of the face does not appear to be augmented.

In Guy's Hospital Reports, Mr. Hilton describes a case in which a tumor similar in signification to the one just described spontaneously separated from the face. The patient was a man aged thirty-six, who, twenty-three years before Mr. Hilton saw him, noticed a pimple below the left eye, close to the nose, which he irritated, and from that spot the tumor appears to have originated. The tumor, in its growth, displaced the eyeball, giving rise to excruciating pain, which subsided on the bursting of the ball. It began to loosen by a process of ulceration around its margin six years before it fell out, which event was unattended by bleeding or pain. The tumor weighed $14\frac{3}{4}$ ounces. It was tuberculated externally, and an irregular cavity existed at the posterior part. A section presented a very hard, polished surface, resembling ivory, and exhibited lines in concentric curves, enlarging as they were traced from the posterior part. The huge cavity left by the tumor was bounded below by the floor of the nose and antrum, above by the rontal and ethmoid bones, internally by the septum nasi, and externally by the orbit, which had been considerably encroached upon by the tumor.—*Heath's Essay.*

THE TUMEFACTION OF CARIES.

Still another form of the inflammatory tumor is that frequently associated with caries. These enlargements are the result of underlying pus and débris, which, instead of forcing a vent, lift off the tissue from the bone. It might be thought that such tumefactions would not be at all difficult to diagnose, but this would be found an error, as the thickening of the walls of the tumor is not unfrequently so great as to give the feel of a solid body; then, again, ragged-looking fistulæ occasionally exist, which, when probed, do not lead with any directness to the diseased bone; while still again it happens that there is no carious bone to lead to, as the disease has ended in necrosis, and some perhaps insignificant sequestrum has concealed itself by an encystment in the walls of the tumor.

CHAPTER XXIV.

THE EPULIDES.

Epulis.—The derivation of this word is from the Greek επι ουλον, signifying "upon the gum."

It is applied by common consent, or rather, I should say, is meant to be applied to a class of tumors having origin from the alveolo-dental periosteum.

In the study of these tumors, every one, I presume, has felt himself more or less confused and confounded. It would, indeed, be surprising if such should not be the case, considering the diversities in description by various writers. And yet these discrepancies, numerous as they are, may be, I think, easily explained away.

First. I will take it on myself to say that the term epulis, when used pathologically, is entirely without meaning or expression, and, as a noun-substantive, should at once be discarded from surgical nomenclature. There is no special disease which can be called epulis, and called so with a distinctive meaning. Let me illustrate: salivary calculi rest upon the gum (επι ουλον). Is not therefore a calculus an epulis?

The term is inadequate in expression, used as a noun, and must ever remain so, because from the alveoli of the teeth grow tumors of various signification. Thus, we have fibroid, the fibro-recurring, the myeloid, the polypoid, the encephaloid or carcinomatous, the simple pulp fungoid, etc. Hence the confusion which marks the writings of nearly all authors on the subject—each, without prefatory explanation, describing the various growths under one common head. Take even Mr. Fergusson, so eminent as an oral surgeon, for example: "Epulis," he tells us, "is a disease which begins as a small spot on either the outer or inner surface of the gums." Again, he says: "Epulis consists of a swelling of solid bone, the hard parts of the bone being primarily affected." Again: "Epulis is an osseous cyst, containing a glairy or a serous fluid." He also instances a polypus, and calls it, too, an epulis.

Mr. Paget, on the contrary, seems to ignore the existence of epulis.

Let the student turn to his history of the myeloid diseases, and see how he treats our επι ουλον.

I have studied this subject closely; I think I may lay claim to being familiar with most authors who have written in the direction, and I have satisfied myself that the various discrepancies are only seeming; that all differences are to be reconciled simply by the abnegation of the word epulis, as a noun-substantive, using it only as an adjectival-noun. Let me illustrate: suppose the spot upon the gum to which Mr. Fergusson alludes should be of the character of epithelioma—then, pathologically speaking, it might be cancer; but, being situated upon the gum, επι ουλον, it would also be epulis. Take the bony tumors (evidently osteo-sarcomatous, as in our classification we are hereafter to study them), wait until their growth shall extend so as to emerge from the gums, they will still remain sarcomatous, but they will also have become epulic.

So also the myeloid tumors instanced by Mr. Paget as being mistaken for the epulides; being upon the gums must necessarily have been true epulides, and those who disagreed with Mr. Paget, calling them by such names were right—right in a sense. Yet also was Mr. Paget right.

The one class called them epulic, because they were situated upon the gums, and it was their creed so to call all tumors so situated. The other designated the growths pathologically; the tumors were marrow-like, the situation of them was of no consequence. Now, let us see how easy it would seem to be to reconcile these different descriptions of one and the same disease. Suppose we drop the word epulis, as a noun-substantive, as a term having pathological meaning, and apply it in accordance with its anatomical derivation. The tumors were myeloid, they were situated upon the gums—we will call them "epulo-myeloid;" is not the difference here reconciled, and is not the compound solidly expressive? An epulo-myeloid growth is a tumor situated upon the gums, marrow-like in pathological character. Here is expressed at once, and happily, as it seems to me, location and character.

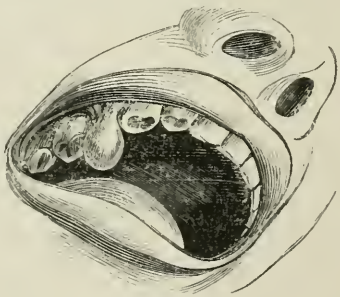
If the reader is prepared, from the argument, to accept of the change proposed, all confusion will be found to have disappeared. We have no longer any tumor of the mouth which we know as an "epulis;" but we have epulo-myeloid, epulo-fibroid, epulo-fibro-recurring, epulo-carcinoma, or whatever other class of tumor pathologically may present itself to us situated upon the gums. By such

change in nomenclature, we make this *pons asinorum* an easily-crossed one; we create a term as patent to the scholar, and as expressive, as the compound expression gastr-algia, cephal-algia, gastr-itis, cerebr-itis, etc.

History of a few Cases Illustrative of Practice in this Direction.

Case I.—Some four years back, Mrs. T., the sister of a medical friend, was brought by the brother to my office for consultation on a tumor (about the size of an ordinary pea) growing from the alveolus of an upper molar tooth. I thought this tumor belonged to the class pulp-fungoid. There was the broken palatine fang in the jaw, but so deep as to be only fairly discernible to the probe; I could not see the origin of the growth, but inferred its character; by separating carefully the alveolus from the fang, I was enabled, after some little trouble, to get the root from its bed. The little tumor proved to be an outgrowth of the periodontal membrane, and not an excrescence from the pulp; in character it was distinctly and decidedly fibrous—it was, then, an epulo-fibroid tumor. It did not look like a growth from the periosteum, but rather as if its origin was in the crusta petrosa, and it had carried the periosteum before it somewhat like the infundibuliform fascia is made a tunic to the descending in-

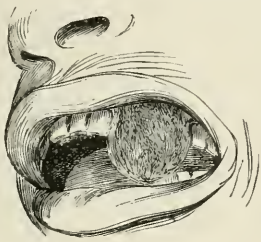
Fig. 75.—Small Epulo-Fibroid Tumor—from Life.



testine in an oblique inguinal hernia. The removal of the fang brought the growth cleanly way; of course, no scraping or cutting of the parts was at all necessary; the growth was evidently an emanation of the dental aspect of the periosteum, and had in no way involved its alveolar reflection. No treatment of any kind outside of the removal of the tooth was employed; the patient remains perfectly cured.

Case II.—Mrs. J. presented herself some time in 1862, with a livid, threatening-looking tumor, the size of a hickory-nut, occupying the left alveolar face of the upper jaw, extending from the lateral incisor back near to the tuberosity. This tumor diminished in size during sleep, and increased during the time of any excitement which tended to accelerate the circulation, sometimes seeming like a solid body, at others, like a spongy mass; it evidently was erectile in its nature, analogous to the ordinary nævi. It was an epulo-erectile tumor.

Fig. 76.—Epulo-Erectile Tumor.



Separating the growth from the gum, its association with the periosteum was plainly evident; while the probe revealed extensive caries of the neighboring bone. An operation, which resulted in complete cure, was performed as follows: the lip being held well out of the way by an assistant, an incision was made, extending from the central incisor tooth of the affected side back to the tuberosity, a similar cut being carried back on the palatine face of the tumor to the place of beginning: these cuts were made freely through the soft parts down to the bone, and completely circumscribed the tumor, with a reasonable margin to spare. The central incisor was next extracted, and, with the ordinary cutting-forceps, a cut was made through its alveolus, extending almost to the labio-nasal angle. A second pair of cutting-forceps was now taken up, and by two cuts the width of its blades, the involved bone was removed; the section extending, as is evident, from the situation of the left central incisor to the tuberosity. Considerable hemorrhage attended the operation, although the section was well outside of the vessels involved, three ligatures being required.

After-Treatment.—The lady being of very full habit and of markedly sanguine temperament, magnesia sulph. ℥ss was ordered the evening of the operation. As an opiate, morph. sulph. gr. ss.

Day after Operation.—Marked inflammatory action, attended with considerable swelling of the tissues of the face.

℞.—Plumbi acet. ℥ij;
Tinct. opii, ℥ij;
Aqua, ℥xvi.

Ordered a cloth wet with the preparation to be kept continuously upon the face.

Third day. Inflammation increasing; eyes completely closed from the great œdema of the lids; mag. sulph. reordered, with hot pediluvia; eyelids heavily painted with tinct. iodine.

Fourth day. Erysipelas set in; the face looking like a glistening red ball; patient restless, nervous, and frightened; painted the whole face with tinct. iodine, officinal strength; the lead-water and laudanum continued; iron and quinine internally.

℞.—Tinct. ferri chl. ℥iij;
Quinia sulph. grs. xxv.
Sig. Fifteen drops in water every three hours.

Also a diaphoretic.

℞.—Liq. ammoniæ acetatis, ℥ij.

Sig. Tablespoonful every ten minutes until profuse perspiration is induced.

Sixth day. Erysipelas evidently yielding; iron and quinine; painting with iodine, lead-water, and laudanum, continued.

Seventh day. Much improved; the erysipelatous redness gone; skin wrinkling; patient can see a little from one eye; continued the painting with the iodine, and the application of the lead-water lotion.

Ninth day. Inflammation all gone; patient quite comfortable; the exposed bone covered with a thin layer of healthy granulations; case progressing well.

Twelfth day. Patient attending to household duties; mouth of course very tender, but advancing toward a cure rapidly.

Twenty-fifth day. Patient may be called well; needs no further attention.

To complete the case, artificial teeth have been inserted, the plate being made to fill up the place of the lost bone. No one would ever suppose, in looking at the lady, she had lost such a portion of the jaw.

Case III.—Mrs. S., of Camden, N. J. Epulo-fibroid tumor of left superior maxilla. This tumor was the size of a large walnut, the

bulging of the cheek from its presence quite deforming the patient; growing very rapidly; painless. Patient had been confined with her fourth child five weeks before presenting herself.

Operation.—This was performed three weeks later, the infant being eight weeks old. The tumor, or all that portion of it which was free of the bone, was cleanly removed with the scalpel, together with a margin of surrounding healthy tissue. This step exposed the bone, which was found carious. This was to be removed, and which was easily and happily effected through the use of the gouge, little by little being cut away until healthy structure was exposed. The surgeon recognizes such healthy structure both by its feel under the instrument, and its appearance; healthy living bone being white, studded with minute bleeding points. Hemorrhage during the operation was considerable, but was controlled, without ligature, simply by throwing alum-water into the wound from an ordinary syringe.

After-Treatment.—Very little required; a wash of the permanganate of potash, five grains to the ounce of water, was given as a disinfectant, there being for a few days a somewhat disagreeable odor from a decomposing blood clot. No antiphlogistics, or systemic treatment of any kind was required, not a bad symptom having appeared, the patient being entirely well in three weeks from the day of operation. In this case the floor of the antrum was removed and the cavity wholly exposed. At the completion of the cure, it was, however, closed up.

Case IV.—Mrs. T., West Chestnut Street. Tumor of four years' growth; loosely fibrous in structure, occupying one-half of the roof of the mouth, giving a most disgusting and threatening appearance. The growth had first appeared between the bicuspid and first molar teeth, and at the time of my first seeing it, had entirely destroyed the inner alveolar plate of all the portion of the jaw with which it was associated. In raising the tumor from its bed, all the underlying palatine process, as far as could be seen, was found to be diseased.

Operation.—This consisted in cutting away as much of the growth with the scalpel as possible, and completing the operation on the bone with the gouge; the hemorrhage very profuse, the use of a compress being necessary for its arrestation; and this only effected after several hours.*

* Hemorrhage sometimes attends these operations where the ligature cannot be applied, and where it is not expedient to employ measures which are apt

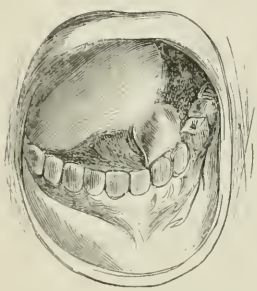
After-Treatment.—Very little required; some overinflammatory action, but which quickly and readily yielded to low diet for a few days, and a single dose of sulphate of magnesia. In three weeks the case was in condition to be dismissed.

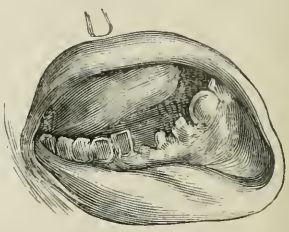
Case V.—Mrs. C., colored. Epulo-fibro-recurring tumor of upper jaw; had been twice imperfectly removed by her physicians; the osseous structure in neither instance being included in the operation. Tumor the size of a small orange, and involving the whole antrum of the affected side. Proposed the removal of the whole maxilla, the only operation which I conceived promised permanent relief. The operation was objected to by the patient.

History of Case.—Day by day the tumor increased in volume; soon the floor of the orbit was thrown up and the eye protruded upon the cheek; a short time longer and the growth passed into the cranial cavity, destroying the patient.

Case VI.—Recurring epulo-fibrous tumor. These two views, from life, represent the case of a young lady as an epulic tumor appeared

Figs. 77 and 78.—Epulic Tumors.





when first operated on, and as it reappeared and was reoperated on some four months after the first.

I subjoin the history, because it exhibits what experience will designate as a proper mode of practice in such cases.

The patient, a young lady of much more than ordinary personal attraction, applied for treatment of the tumor as represented in the first view. The necessity for an operation being explained to patient and parents, I made the following suggestions: First, that a section

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to be attended with secondary bleedings, as, for example, the acutal cautery. In this case the compress was made of a tuft of cotton, saturated with alum-water.

be made which should simply remove the tumor and alveolar process connected with it. If this should succeed, there would be no deformity. Second, if the growth should reappear, then a second operation to be performed, which should remove the bone proper, except a simple rim of continuity. Third, if this, too, should fail, then the complete section of the bone to be made; this of course would be deforming, but it would be the only resource.

In December, 1866, the first of the operations was performed; the bone outside the section looked perfectly healthy, and gave every promise of a satisfactory result. In two weeks healthy granulations had covered the bone, and in one month the patient was dismissed cured. The following March, however, a small tubercle appeared in the very center of the site of the original tumor, and in the course of three weeks half a dozen new tumors or lobules had sprung up. The second operation, as proposed, was now performed, the continuity and natural arch of the bone being preserved unbroken. This was successful. The patient now (1869) remains perfectly well. The site of the removed bone being occupied by artificial teeth,—not the slightest deformity is to be observed.

Fig. 79.—Section of Bone as first and afterward made.

This is a type of many similar ones that have occurred in my experience. It might be thought the better practice to make the deep section first. It may be that this is so, but the first operation is so very simple compared with the second, is so quickly done, and with so little shock or risk, and is, withal, so frequently successful, that the mean of my cases indorses the practice suggested.

The history of the epulides is progressiveness. The case represented exhibits the disease in what might be termed its incipiency. When the bone in its whole thickness has become involved in the morbid condition, there is but the single operation that promises any hope of cure, and that is—complete and full section.

Fig. 80 represents the celebrated case of Mary Griffiths, operated on by Mr. Liston in 1836. The following summary of it is given by Mr. Liston in a paper on Tumors of the Jaw:

The patient had labored under the disease for eight years, and

had been subject to a partial removal of the growth when of inconsiderable size. The tumor was of fibrous nature as regards its disposition, form, and intimate structure. It differed somewhat, however, in outward appearance, in consequence of its exposed situation.

Fig. 80.—Fibrous Epulis of Upper Jaw.

The growth sprang originally from the gums and sockets of the incisors and canine teeth of the left side; at an early period it protruded from the mouth, unconfined and uninfluenced by the pressure of the lips or cheek. It had assumed a most formidable size and appearance, concealed the palate and pharynx, and gave rise to great inconvenience and suffering. The surface had been broken by ulceration, but upon close inspection of the projecting part, and of that covered by the cheek, it was found to possess a firm consistence, and to present a peculiar botryoidal arrangement of its parts.

An operation proved perfectly successful.

CHAPTER XXV.

OSTEO-SARCOMA.

However much—and it may be justly—the term osteo-sarcoma is abused, it still manages to hold its place in surgical nomenclature. Employed indiscriminately, as it long has been, it must certainly be perplexing enough to that class of professional men who study names and shadows rather than the substance of things; for, like the word epulis, osteo-sarcoma has been made to represent the most unlike pathological conditions, and the greatest diversity of features.

The term, as is seen, is a compound one, and is derived from the Greek *ὀστέον*, signifying bone, and *σάρξ*, meaning flesh; and by those who created the term, could only have been intended to stand as the representative of a class of tumors which were fleshlike in appearance, either fleshy tumors in or upon bony structures, or a transformation of bone into fleshy substance.

I cannot say that, to me, the term seems such an ill one; it is certainly expressive; it is no fault of the word that men will misuse it. Be it as it may, however, there are so great a number of oral tumors which are made to come within its classification, that no direction of our study demands from us a closer understanding; and such understanding implies that we should look at the subject from every standpoint.

Osteo-sarcoma cannot, from its origin, apply to a strictly special disease; it is a noun of multitude, just as is epulis when it is used as a noun. We speak of the human face when we would direct attention to the countenance; so, also, we speak of the face of a landscape, the face of the moon, or the face of things generally. Now, the word face is, without doubt, a very admirable word, but still it tells nothing of the many different kinds of faces. To be special, it must have some adjectival prefix. With such prefix we get every proper shading of the expression, and can employ it freely to our own satisfaction, and to the making of ourselves perfectly understood by others. Thus, we say of one man that he has a bright face, of another that he has a dull face, etc. Osteo-sarcoma requires equal

latitude. Thus we have a fleshy-looking tumor which is benign; and we have another which is malignant. Both of them are sarcomatous, inasmuch as they are fleshlike; yet they are very different kinds of tumors, so far as a prognosis would be concerned.

By the term "fleshlike," I do not, however, understand that muscle-like structure is specially implied; as all descriptions, however far back I have been able to go, seem to refer rather to an imperfect sort of fibrous or fibro-plastic tissue.

Prof. Gross, speaking of the diseases of the maxillary bones which seem to require the operation of excision, says they—the diseases—are generally described under the vague and unmeaning name of osteo-sarcoma, and constitute a group of affections defying every attempt at correct classification. That this declaration, he says, is not a mere assumption unsupported by facts, the writings of pathologists and surgeons abundantly testify.

Prof. Henry H. Smith, in his Surgery, page 483, thus writes on osteo-sarcoma: the bony and fleshy tumor, or osteo-sarcoma, is another ancient name, sometimes indiscriminately applied to a tumor analogous to spina ventosa. Both these tumors are malignant in their character, and would be better designated as enchondromata, or as cancer of bone, the growth being generally due to a deposit of carcinomatous matter in the bone, causing an expansion both of its compact and cancellated tissue. In spina ventosa, he says, the greatest development is of the cancellated structure; while in osteo-sarcoma it is rather the compact layer and the external periosteum that are involved, the cancellated tissue being filled with a fleshy carcinomatous structure; while the enlarged cells are sometimes also filled with limited effusions of blood, or a lardaceous, soft, pulpy deposit.

Mr. Fergusson says the non-malignant or benign tumors are represented by what Mr. Abernethy calls simple sarcoma. These are tumors of a solid fleshy character throughout; or they may consist of a bag or cyst, which contains fluid, or of a combination of these two, for there may be one cyst or more in a tumor whose general character is sarcomatous; and in another case a cyst may ultimately assume the appearance of a more solid growth.

Prof. Gross, in his work, "Gross on the Bones," defines osteo-sarcoma as an alteration of the osseous tissue, in which the substance of the bone is converted into a mass more or less analogous to cancer of the soft parts. The origin, he says, is, in most cases, referable to an hereditary disposition or to external violence; it gen-

erally comes on with deep-seated, lancinating pains, which continue a considerable time before there is any evident enlargement or swelling. The form of the tumor he describes as either smooth and circumscribed, or unequal, and, as it were, tuberculated, etc. For continuation of this paper, see his book, page 181.

Eustachius speaks of certain calcareous concretions deposited about the necks of the teeth (tartar or salivary calculi evidently), and Manget classes such concretions with the sarcomatous growths.

Prof. Dunglison, in his dictionary, defines osteo-sarcoma as a disease of the bony system, which consists in softening of its laminæ, and their transformation into a fleshy substance analogous to that of cancer, accompanied with general symptoms of cancerous affection.

Mr. Paget says the name of cartilaginous tumor may be given to those which Miller, in one of the most elaborate portions of his work on cancer, has named enchondroma. In a foot-note, Mr. Paget says another name employed for these tumors is benign osteo-sarcoma. In a second foot-note he says, under the vague name osteo-sarcoma many include together and seem to identify all growths in which bone is mingled with softer tissue.

Miller, in his "Principles of Surgery," says by the term osteo-sarcoma is understood a tumor composed partly of bone and partly of fleshy substance, as the name implies: the latter constituent of a simple, non-malignant character. The formation is usually attributable to external injury, perhaps slight, and originates in the cancellous texture of the bone. The osseous part is analogous to the fibrous interlacement in tumors of the soft parts. It is, as it were, the stroma, in which the other constituent is deposited, dense and solid, centrally radiating in spiculæ outward, which always diverge and interlace, leaving interstices more or less wide, in which the fleshy substance is deposited, etc. See page 442 for differences, as given by this author, between osteo-sarcoma and enchondroma and osteo-cephaloma, etc.

Lebert places the whole class among the cancroid growths, and denies that tendency to return furnishes any sufficient evidence of a cancerous origin.

Miller, in another part of his "Principles of Surgery," says he desires candidly to admit that the class is "not certainly a well-defined one." It has been doubted, he says, whether some variety of these fibro-plastic growths would not be more properly classed among the malignant tumors, as they have been found prone to return, after excision, with singular obstinacy.

Spina ventosa, as remarked by Prof. Smith, is freely enough confounded with the osteo-sarcomatous growths. Now, the first is a term meant to imply an empty cyst, such as on a previous page I described as simple cysts: ventosa, a word from the Arabic, signifying windy; while the latter implies a solid, or comparatively solid, tumor. This definition differs, I am aware, from that given by Prof. Smith; but I employ the term, and recognize it only in accordance with its literal meaning. If, then, spina ventosa means a sharply-defined empty cyst, or, to give another definition to the prefix spina, "a cystic tumor accompanied with pricking pains," then it cannot simulate so as not to be recognized.

And so I might go on through all the authors upon my shelves—each one describes the disease, but classifies it differently. A review which I made of many authors reminded me graphically of Brummacher's impressive anecdote of the bringing of the priests from the Babylonian war by Alexander: "Bild und Zeichen ist nicht das Wesen." But I have quoted enough—and have chosen authors presumed to be familiar to my readers—to exhibit the confusion which exists in the nomenclature of this direction of the maxillary tumors, and to excuse me, I trust, from any appearance of egotism in choosing my own terms and my own way to describe these diseases. I do not know that I shall succeed better than many others in making myself understood, but I shall, at least, adhere strictly to the text, and map out the tumors as I have met with them in practice.

I choose, then, the compound osteo-sarcoma, and I mean the term to apply to a class, and not a species. I mean it to stand as the representative of any tumor in or upon bone, which is osseo-fibro-plastic. Let that tumor be benign or malignant—this proposition is to be distinctly borne in mind.

Osteo-sarcomatous, or osteo-fibro-plastic (synonymous) tumors are to be esteemed doubtful growths. Thus I have seen two or more alike, to the unassisted eye; yet one has succumbed readily to treatment, while the others have bid defiance to every operative proceeding, and have gone on to the destruction of the patients. In minute structure (pathological character) such tumors must have, of course, varied greatly.

The fibrous tumors of the jaws described by Mr. Paget—see his Lectures on Surgical Pathology—I would class with the osteo-sarcomatous; so also the growth which he describes as myeloid. (See same Lectures.) Of the first, he says, as to situation and con-

venience, the fibrous tumors of the jaws may be found isolated and circumscribed, growing within the jaw, divorcing and expanding its walls, and capable of enucleation; but in a large number of these tumors, the periosteum, with or without the bone itself, is involved, or included in the outgrowing mass. In the case of the upper jaw, either the periosteum or the fibro-mucous membrane of the antrum, or nasal walls, or both these, may be included in such a tumor. In all these cases the tumor lies close upon the bone, and cannot be cleanly, or without damage to it, separated, except on the outer surface; commonly, indeed, bony growths extend from the involved bone into the tumor; and sometimes the greater part of the bone is as if broken up in the substance of the tumor.

The character of these growths, Mr. Paget remarks, is easily recognized in the fibrous tumors of the gums and alveoli.

In the chapter on the Epulides, I referred to a tumor which is a fibrous outgrowth from the alveolo-dental periosteum. This same class of growths spring from the lining membrane of the sinus maxillare, and, enlarging, dispart the bones, bulging out as a tumor upon the face: they are osteo-sarcomatous tumors, or, it would be more correct to say, sarcomatous tumors, purely fibro-plastic in structure, and perhaps exclusively benign. Such growths, if early and properly removed, are not apt to return. I have met with these tumors over and again; they always seemed to me to have association with the bone only, when such association was forced, as it were, on them. Such tumors are exclusively periosteal in their immediate relationship. I have examined them with the microscope, but have found them made up almost exclusively of simple fibrous tissues. If these tumors have not advanced too far, you will see them, on taking away the outer wall of the antrum, as some foreign body which has been impacted closely within the part; they have not the slightest pathological association with the bones, if we except their periosteal pedicel or base. Indeed, such seems the tendency to exclusiveness, on the part of these growths, that I have seen them when they were as large as a fœtal head, the integument of the cheek alone covering them, the bone which must have originally formed their external envelope having completely disappeared through absorption.*

The myeloid tumors of Mr. Paget seem to me justly classible with the sarcomatous, inasmuch as they so closely resemble fibro-plastic

* These tumors are not the polypi of the antrum.

structures as to lead to the inference that such portions as seem marrow-like are rather the result of retrograde metamorphosis—a metamorphosis into the medullary type of carcinoma—than of original pathological development. It was on account of their being made up of the fiber cell that M. Lebert gave such growths the name "fibro-plastic."

I do not, however, presume to dispute pathology with Mr. Paget: so far as the purpose of our present classification is concerned, I have only to do with the fleshy appearance of these tumors. Minutely they may have been made up of marrow-like substances, but if in general appearance they are fibro-plastic or fleshlike, then they belong to the class sarcomatous, or, when found associated with bony tissue, osteo-sarcomatous.

A myeloid, says Mr. Paget, like a fibrous tumor, may be either inclosed in a bone whose walls are expanded round it, or, more rarely, it is closely set on the surface of a bone, confused with its periosteum. The sketches of fibrous tumors pictured in his Surgical Pathology, page 406, might, he says, be repeated for myeloid tumors.

Mr. Paget sets down these two kinds of tumors as being equally common to the jaws, both the superior and inferior.

When, he says, the myeloid is inclosed in bone, the tumors usually tend to the ovoid or spherical shape, and are well defined, if not invested with distinct thin capsules; seated on bone, they are (as exemplified by the epulic structures) much less defined, less regular in shape, and often deeply lobed. They feel like uniformly compact masses, but are in different instances variously consistent. The most characteristic examples are firm, and (if by the name we may imply such a character as that of the muscular substance of a mammalian heart) they may be called fleshy. Others, he says, are softer, in several gradations, to the softness of size gelatin, or to that of a section of granulations. Even the firmer are brittle, easily crushed or broken, they are not tough, nor very elastic, like the fibro-cellular or fibrous tumors, neither are they grumous or pulpy, neither do they show a fibrous or granular structure on their cut or broken surfaces.

Mr. Paget describes sections of these tumors as appearing smooth, uniform, compact, shining, succulent, with a yellowish, not a creamy fluid. A peculiar appearance, he says, is given commonly to them, by the cut surface presenting blotches of dark or livid crimson, or of a brownish or a brighter blood color, or of a pale pink, or of all these

tints mingled on the grayish-white or greenish basis color. (In a foot-note, Mr. Paget quotes from Lebert, who says the greenish-yellow color that may show depends on a peculiar fat, xanthose.) The tumors, he says again, may all be pale, or have only few points of ruddy blotching, or the cut surface may be nearly all suffused, or even the whole substance may have a dull modena or crimson tinge, like the ruddy color of a heart, or that of the parenchyma of a spleen. Mr. Paget believes that many of what have been named spleenlike tumors of the jaws have been of this kind. The color they present, he says, is not due merely to blood in them; some of it is appropriate to their texture, as is that of the spleen or that of granulations, and it may be quickly and completely bleached with alcohol.

The following are the microscopic appearances which Mr. Paget says are peculiar to the myeloid growth, being imitated in no other morbid structure.

1. Cells of oval, lanceolate or angular shape, or elongated and attenuated like fiber cells, or caudate cells, having dimly dotted contents, with single nuclei and nucleoli.

2. Free nuclei, such as may have escaped from the cells, and among these, some that appear enlarged and elliptical, or variously angular, or are elongated toward the same shapes as the lanceolate and caudate cells, and seem as if they were assuming the character of cells.

3. The most peculiar form; large, round, oval, or flask-shaped, or irregular cells or cell-like masses, or thin disks of clear or dimly granular substance, measuring from one three-hundredths to one-thousandth of an inch in diameter, and containing two to ten or more oval, clear, and nucleolated nuclei.*

Corpuscles, such as these, irregularly and in diverse proportions, imbedded in a dimly granular substance, make up the mass of a myeloid tumor. They may be mingled with molecular matter, or the mass they compose may be traversed with filaments or with bundles of fibro-cellular tissue and blood-vessels, but their essential features (and especially those of the many-nucleated corpuscles) are rarely observed.

Many varieties of aspect (as remarked by Mr. Paget) may thus be observed in myeloid tumors, and beyond these they may even be

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* These microscopic elements, as referred to in the chapter on Epulis, are presented on page 449 of "The Surgical Pathology."

so changed that the microscope may be essential to their diagnosis. After they partially ossify, well-formed cancellous bone being developed in them, cysts, also filled with bloody or serous fluids, may be formed in them, occupying much of their volume, or even almost excluding the solid texture.

Mr. Paget says he lately amputated the leg of a woman, twenty-four years old, for what was supposed to be a cancerous tumor growing within the head of the tibia. She had pain in the part for eighteen months, and increasing swelling for ten months, and it was plain that the bone was expanded and wasted around some soft growth within.

On section, after removal, the head of the tibia, including its articular face, appeared expanded into a rounded cyst or sac, about three and a half inches in diameter, the walls of which were formed by this flexible bone and periosteum, and by the articular cartilages above; within there was little more than a few bands or columns of bone, among a disorderly collection of cysts filled with blood, or blood-colored serous fluids. The walls of most of the cysts were thin and pellucid; those of others were thicker, soft, and brownish yellow, like the substance of some medullary cancers, a likeness to which was yet more marked in a small solid portion of tumor, which, though very firm, and looking fibrous, was pure white and brainlike.

None, Mr. Paget says, who examined this disease with the naked eye alone, felt any doubt that it was an example of medullary cancer, with cysts abundantly formed in it. But on minute investigation, none but the elements of the myeloid tumors could be found in it; these, copiously imbedded in a dimly granular substance, appeared to form the substance of the cyst walls, and of whatever solid material existed between them. The white brainlike mass was apparently composed of similar elements in a state of advanced fatty degeneration, but neither in it nor in any other part could be found a semblance of cancer cell.

Mr. Paget fails to inform us as to a return of the disease; it does seem to me that in the present state of our knowledge of cancer growths, it would have been a very difficult matter to have classed such a tumor with the non-malignant. It certainly was very heteroclitic in character, and whatever we individually may feel disposed to think of such a structure, it serves to exhibit the merging of the benign into the malignant, and their relationship. A consideration of such cases as this should serve to keep the practitioner on his

guard, preventing his being too confident in any prognosis he may give to a patient.

An epitome of the myeloid may thus be presented:

They are a class of fleshy tumors called by M. Lebert fibro-plastic, because, he says, they are made up of fiber cells. They are called myeloid by Mr. Paget, because he thinks they much more resemble marrow than fibrous tissue.*

In character, according even to Mr. Paget, they vary from simple semi-fibrous, semi-marrow-like structures to those so heteroclitic that they seem to merge into the medullary.

Their favorite seat seems to be about the bones, either intra or extra, being, perhaps, more common to the maxillæ than in the other osseous structures.

They are growths which usually occur singly, they are more frequent in youth, and very rare after middle age; they generally grow slowly and without pain, and usually commence without any known cause, such as injury or hereditary disposition.

According to Mr. Paget, they rarely, except in portions, become osseous; they have no proneness to ulcerate or protrude; they seem to bear even considerable injury without becoming exuberant; they may shrink or cease to grow; they are not apt to recur after complete removal, nor have they in general any features of malignant disease.

Since writing the above I have accidentally fallen upon a classification of the tumors of the upper jaw, made by Mr. Hancock. After alluding to various classes, he says: "In addition to these, Mr. Paget adds what he terms myeloid tumors of the part; but while the examples he quotes resemble on the one hand so much the fibrous, on the other the medullary tumors, their true character, whether innocent or malignant, is so very doubtful that I should hesitate in admitting them as a distinct class."

I am pleased to quote this from Mr. Hancock. There are already quite enough subdivisions without counting in such as can be done very well without. Indeed, it is because I so prefer a general, tangible, rather than a hair-splitting classification, that I am disposed to stick to the embracing term of sarcoma. I understand pretty well what one means when he tells me of an osteo-sarcomatous form of growth; he has only further to tell me whether it was benign,

* Mr. Paget does not call all fibro-plastic tumors myeloid; he only says a myeloid is different from the ordinary fibro-plastic of Lebert.

disposed to malignancy, or already malignant, and I understand exactly what he means.

Fibrous tumors proper, and the fibro-plastic, have general features in common,—that is, they belong to the class of sarcomatous growth; but then, in a pathological sense, they have such differences that an epitome, at least, of their history should be reviewed by us.

In some instances, fibrous tumors are seen under the microscope to have a concentric development; this species is slowest of growth, is most benign, and never attains any great size.

In another species the fibers interlace in a most complicated and irregular manner. This kind attains the largest size, and seems striding toward the heteroclitic.

A third class consists of an aggregate of nodules, and is compared by Dr. Humphrey to a conglomerate gland; the tumor being made up of small masses closely compressed together, having an uneven, knotty outline.

Fibrous tumors affecting the bones (Braithwaite) are usually found upon those of a spongy nature, upon the ends of the long bones, the phalanges, pelvis, and lower jaw. (I will take the liberty here to correct the author. I have described these tumors as associated with the alveoli, with the external periosteum, and with the antrum of Highmore, and I know that they do thus affect *both* jaws, as I have met with them often enough practically, and so has every one who has had any extent of experience.) So far, says this author, as I have met with them, they are confined to the exterior of the lower jaw, growing from the periosteum and creeping along the surface of the bone in such a manner as to prove almost to a certainty that they originate in some morbid condition of the periosteal fibers. The bone underneath these tumors may suffer absorption in consequence of the pressure produced, but does not seem to be affected in any other way. They appear upon the maxillary bone more frequently than upon any other part of the skeleton. On the lower jaw they spread along the ramus, encircling it beneath and on the sides, so that the bone is almost concealed by the tumor. In some instances they form within the substance of the jaw, probably from the alveolo-dental membrane, and as they increase, the walls of the bone become spread out over them. They grow up around the teeth, and when they project into the mouth may be soft and fungous.*

* Presenting this phase the tumor may be classed with the epulic, but it is seen that on this account, there need be no confusion. Many epulic tumors are osteo-sarcomatous.

In some instances the fibrous tumors of the jaws exhibit a semi-cartilaginous structure, and now and then fibers or plates of bone are formed in various parts of them. The progress of the disease is well illustrated by a series of tumors of the jaws in the College of Surgeons, London, from the museum of the late Mr. Liston. These preparations serve to show how necessary it is to bear in mind the mode of growth of these periosteal fibrous tumors of the jaws, because from their disposition to creep along the surface of the bone, whether it be an endosteum or periosteum, they are liable to return after removal, unless the immediately adjacent as well as affected parts be excised. The histories attached to the specimens teach that very large fibrous tumors, both of the upper and lower jaws, together with the bones on which, or in which, they grow, may be successfully removed.

Now, as to the degeneration of sarcomatous tumors, it is, I think, a question beyond doubt that a tendency, greater or less, to retrograde metamorphose belongs to this class. I need only instance the myeloid growths of Mr. Paget, just considered. Certainly nothing could more closely resemble medullary cancer, in, we may say, its incipient stage. And what are we to understand of the recurring fibrous tumors, if there is no carcinomatous association?

Concerning the diagnosis of the sarcomatous tumors, and the ability to follow them through their gradations, it seems most important that we should not be ignorant of the distinguishing signs that exist.

I remarked that osteo-sarcoma was not unfrequently confounded with spina ventosa. Now the point at which these two different conditions most nearly approach each other is in the hydatid and other cysto-sarcomatous growths.

Cysto-sarcoma, as implied by the prefix, is a tumor of only semi-solidity, its interior, or stroma, being made up of cysts and fleshy substance. These cysts are original formations, and not of secondary character,—that is, they are not the result of molecular disintegration. They are lined sacs, having a distinct secretory membrane. Miller describes the contents of these cysts as widely differing, and which every one must have observed: "They are more or less fluid, sometimes a clear gluey liquid, sometimes a gelatinous, pale mass of semi-solid consistence, elastic, and projecting beyond the level of the cut cyst on a section being made; sometimes a solid, consisting of a fibrous deposit, organized very imperfectly, if at all; sometimes of an exanthematous or poppy consistence,

as in many encysted tumors; sometimes, but more rarely, a dark fluid, like printer's ink, is contained; sometimes blood is mingled with the contents, either in the solid or in the coagulated form."

The very nearest approach, however, made by cysto-sarcoma to spina ventosa, is in that class, very well named by some one, as I remember to have seen, the "cysto-succulent." These are sarcomatous tumors, the stroma of which is made up of very loose fibro-cellular tissue. They might well, in their contents, be likened to that of a water-melon, solid enough on section, but compressible to a few shreds. The fibrous contents of the stroma are, however, always a distinguishing sign. These tumors are very rare, and particularly so about the bony structures.

Müller has described a variety of these cysts of sarcomatous growth, which he calls cysto-sarcoma phyllodes. "The tumor," he says, "forms a large firm mass, with a more or less uneven surface. The fibrous substance, which constitutes a greater part of it, is of a grayish-white color, extremely hard, and as firm as fibro-cartilage. Large portions of the tumor are made up entirely of this mass, but in some parts are cavities or clefts, not lined with a distinct membrane (an exception to the rule in cystic tumors). These cavities contain but little fluid, for either their parietes, which are hard, like fibro-cartilage, and finely polished, lie in close apposition with each other, or a number of firm, irregular laminæ sprout from the mass and from the walls of the fissures, or excrescences of foliated or wart-like form sprout from the bottom of the cavities and fill up the interior. These excrescences are perfectly smooth on their surfaces, and never contain cysts or cells. The laminæ lie very irregularly and project into the cavities and fissures like the folds of the psalterium in the interior of the third stomach of ruminant animals. Sometimes the laminæ are but small, and the warty excrescences from the cysts are very large, while, in other instances, both are greatly developed."

Cartilaginous, or the enchondromatous tumors of Müller, might, perhaps, for all practical purposes, be classified with the sarcomatous, for while it might demand some little stretch of the imagination to convert a cartilage into looking like a fleshy mass, yet surgically the species are very much alike,—that is, both are reasonably benign, both are little amenable to the action of the sorbefacients, and both are better treated by the knife than in any other way.

As we understand the osteo-sarcomatous tumors proper to be outgrowths associated commonly with periosteal membranes, so we are

led naturally to ask ourselves as to the cause of their formation. This I conceive to be twofold: first, as the result of local irritation; second, as the result of constitutional conditions; and, still again, we may combine these two, laying the predisposing cause on the one and the exciting on the other.

My attention was once directed by William Gibson, late Professor of Surgery in the University of Pennsylvania, to a case markedly illustrative of this latter condition. An old gentleman, Mr. F., seventy years of age, was struck on the cheek by a stone. He soon had growing from the site of the injury a tumor, diagnosed by Professor G. as osteo-sarcomatous. The growth of the body was so rapid and so formidable as to incline to the view of its intimate relationship with malignancy. No one would, I think, doubt the twofold relation of such a tumor.

When osteo-sarcoma takes on this rapid growth, its innocency may always be doubted; when the development is slow and regular, and particularly if the origin can be traced to some local irritant, extirpation may be expected to result in a complete cure.

When these tumors are fairly and openly benign, we find no constitutional disturbance associated with them, at least none that are outside of strictly mechanical influences.

Osteo, or simple sarcomatous tumors of the sinus maxillare, should not be mistaken, as has too often been the case, for polypi of the nares. It sometimes happens that these tumors, particularly the softer kinds, find their way through the outlet of the sinus into the nostril, and there simulate very closely a common fibrous polypus; such tumors have been often highly aggravated by operations founded on such mistaken diagnosis. Again, polypi of the nostrils may find their way through the same passage into the sinus, and, enlarging, represent very fairly the ordinary sarcomatous tumor of that cavity. Now, pathologically speaking, being about one and the same thing, it would be little difference where or how the growth should develop, but as operative proceedings are concerned, a mistake of the kind becomes quite an awkward matter.

As regards changes common to the sarcomatous tumors, they may be considered under the heads of softening, suppuration, and malignant degeneration.

Softening, says Dr. Humphrey, appears to take place in two ways:

First, as a chronic process, affecting some circumscribed portion of the tumor, which is usually at or near the center. The change is

observed to commence with a slight discoloration, a yellowish or dark tinge, which is followed by a loosening or incipient disintegration of the structure; at the same time a line of demarkation is formed around the altered portion, which becomes separated, like a sequestrum, from the surrounding mass. Both the detached portion and the cavity are at first rough and thready on their opposed surface; the former undergoes still further disintegration and solution, becoming broken up into a number of smaller fragments, which float about in a dark, dirty, turbid fluid, and which may ultimately disappear.

The process of destruction may go on in the adjacent portion of the tumor, enlarging the central cavity till the whole is reduced to a fluid or a semi-fluid mass, walled in by the capsule of the tumor, which now stands in the relation of a cyst wall to the disorganized contents.

In some cases the softening process is completed without extending the circumference; the ragged processes hanging into the interior of the cavity are removed. The latter acquire a smooth lining, and look like a simple cyst lying in the cavity of the tumor.

A second mode in which softening takes place is more rapid and diffused, the whole or the greater portion of the tumor being affected at once. The change commences with the infiltration into the mass of a serous fluid whereby its texture is loosened and its components separated, at the same time the tissue of the tumor is softened, and interstitial absorption is set up in it.

As the result of these processes combined, the tumor is soon broken up into detached fragments, and reduced to a diffluent pulp, or it may be completely liquefied. These changes, Dr. Humphrey suggests, "are occasioned by some altered nutrition analogous to inflammation; they may be induced by some accidental cause, as an injury; nevertheless they are not necessarily attended with any constitutional disturbance at all corresponding with the extensive destruction which is in progress."

Suppuration.—This is very rare; it may commence internally, or progress from without inward.

Cancerous Degeneration.—The general conditions and features of such degenerations have been considered in the body of the chapter. It remains, however, to point out a second cancerous relation, namely, the existence of compound tumors. Dr. Lewis relates a case where melanotic cancer was deposited in the stroma of a fibrous tumor, and Dr. Humphrey exhibited a large fibrous tumor completely

enveloped in cancer. In such cases we can only infer the fibrous tumor to have existed through a provocative local irritation, while the cancer conjoined with it is a separate and distinct disease, the result of cachexia.

Fig. 81.—Osteo-Sarcomatous Tumor.

This specimen, from the person of an old woman, commenced within the antrum, and progressed four years before causing death. In character it was fibro-plastic, with here and there osseous masses.

Fig. 82.—Cysto-Sarcoma.

This specimen represents a case just operated on by myself. The reader will, from the text, understand it without any special description. The patient was a young man aged about thirty.

CHAPTER XXVI.

OSTEO-CARCINOMA.

In the previous chapter various tumors were referred to, differing, as species are concerned, agreeing as to a general classification; these various species being grouped under the common class term sarcoma.

The class we are now to consider—the heteroclitic—is one which has been equally divided and subdivided, specified and synonymed with the preceding,—so much so, indeed, as to elicit from most authors a confession as to the confusion which seems to render any simple and exact description almost impossible.

Much experience has suggested to my mind that there is but a single cancerous affection of the jaws, or perhaps I will be better able to make myself understood if I say two; all peculiarities, modifications, and associations are but pathological features developed by age or circumstances in the one or the other of these general classes. If this tenure is right, when I describe one, or at best two conditions, with their associations, I shall, for all practical purposes, have told all that need necessarily be known for the general guidance of the surgeon. I think so, at least.

Carcinoma is a word gotten from the Greek *καρκινος*, signifying a crab. According to the classification of Fische, which it suits our purpose to adopt, it applies to a family of diseases which embraces the different forms of cancer.

Osteo-carcinoma is a term, then, which I will adopt to apply to any truly cancerous tumor of the maxillary bones; it embraces the two species which I have said are the only malignant growths found associated with these bones. These species are the types medullaris and scirrhus.

Scirrhus of the maxillæ is an infrequent condition—a quite rare disease. Medullary matter is the pathological feature which characterizes the mass of the carcinomatous tumors of these parts; so constant, indeed, is its presence, that it would scarcely be amiss to say that medullary disease is the only cancer of the jaws.

I suppose I have, in the course of my observations, met with two decided cases of scirrhus of the maxillary bones, both being associated with the superior jaw;* certainly I have not seen more than these two cases. It appears first as a hard mass, a little lump, perhaps, associated seemingly with the overlying soft tissues, movable for a time, but soon becoming fixed, and implicating all the immediately surrounding parts, "casting out its claws," as the people have it. If, after amputation, a scirrhous mass is bisected, it is found to resemble in its stroma the substance of a turnip.

The hardness of scirrhus, says Mr. Paget, when compared with that of most other tumors, is extreme; it is about equal to that of fibro-cartilage, and is associated with a corresponding rigidity, weight, and inelasticity. A characteristic appearance is a slight concavity assumed by these tumors on section, which belong to no other tumors. It differs again on section from the sarcomatous tumors in having no distinct grain or fibrous plan of arrangement.

In microscopic structure it varies still more markedly, its cells being not constant but heteroclitic. Scirrhus, like medullary cancer, tends, but much more slowly, from the occult to the open stage.

With these few remarks on scirrhus, which will serve at least to exhibit that I am not unaware that such form of cancer does occasionally exist in the jaws, we will pass to the medullary form, and which I will now assume is the carcinoma proper and peculiar of the parts.

Miller has, however, several sections on malignant scirrhus of the maxillary bones, which he considers under the heads osteo-cephaloma, osteo-carcinoma, osteo-melanosis, and osteo-cancer. Against these subdivisions I shall not take the liberty to object, leaving it for the reader to judge whether they are not but one and the same disease with modifications.

Our subject can, I think, be divested of much obscurity, if at this point we stop for a single moment to consider the meaning of certain terms which long usage has so associated with cancerous conditions that they must, I am sure, long years ago, have gotten far beyond the meaning originally intended for them. Take for example the term fungus hæmatodes. It is a term used freely and loosely by surgical writers, and is frequently accepted to mean most malignant cancer. Let us analyze this term: we find it made out of the

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* Since writing the above I have met with scirrhus proper of the lower jaw.

Greek *αἷμα*, signifying blood, and *εἶδος*, meaning appearance—of bloody appearance. Any and all granulations being of bloody appearance, are therefore fungi hæmatodes. If, however, it was meant to be applied strictly to pathological features, we might employ it learnedly to express the common proud-flesh of any adynamic ulcer.

Writers use the term as a synonym of medullary cancer, but when they describe fungus hæmatodes, they get a condition and not a principle. They might, with the same propriety, use the word suppuration as a synonym of inflammation. Fungus hæmatodes is a phenomenon, as suppuration is a phenomenon, as pain is a phenomenon attending a cause. Such looseness in describing disease cannot but confuse the student and render our nomenclature unreliable as a source for finding expressive terms; terms that shall be patent everywhere, and under all circumstances. Thus Mr. Hey, who was the originator and maker of the term fungus hæmatodes, employed it as the representative of the open state of medullary cancer; it certainly well expresses the phenomenon, but has no more special meaning.

Alibert calls all the hæmatocies by this same name, and as they are all of bloody appearance, certainly he is justified in so expressing himself.

Dupuytren employs the term in describing the erectile tumors, while Graefe presses it into service in describing the "Telangiectasiæ." Thus, as a first example, we see that there is no peculiar disease of the jaw which can be called fungus hæmatodes. We do not, however, eschew the term; we cannot do without it, as it represents a feature.

Let us take a second. I instanced Miller's fourth classification of cancer of the maxillary bones, the osteo-melanosis. Now the term melanosis refers to a pigment, and signifies simply black or colored structure. I will not myself say that Miller errs in this classification, but will simply note down what Mr. Paget says concerning the colored cancers.

"The melanotic or melanoid cancers are," says Mr. Paget, "according to my experience, with very rare exceptions, medullary cancers modified by the formation of black pigment in their elemental structures. On this long disputed point there can, I think, be no reasonable doubt. I have," he says, "referred to a case of melanotic epithelioma [see his Lectures, page 582], but with this exception, I have not seen or read of any example of melanosis or

melanotic tumor in the human being which might not be regarded as medullary cancer with deposit of black pigment."

These remarks and experiences of Mr. Paget exhibit quite satisfactorily, I think, the fact that this classification is an unnecessary, not to say an unscientific one. The deposit of pigment is not the disease, but merely an accidental feature appearing in its course.

May I not, then, be permitted to suggest that the term, in the special sense in which it is employed by Mr. Miller, may be dropped without detriment to nomenclature?

The osteo-cephaloma of Miller is medullary cancer.

Osteo-carcinoma; I have given the derivation of this term, and exhibited its character as a noun of multitude.

Miller, in his classification, thus writes: "Osteo-carcinoma is comparatively rare; when it does occur it is usually as a secondary symptom of malignant cachexia, the primary indication of which has been the formation of carcinoma in the soft parts."

If, in this classification, Miller is compared with other authors, his meaning will be difficult to make out. If he had not so specially classified the disease, I would suppose he meant the same as Fische; but osteo-carcinoma, as Fische employs the term, and as we here follow him, is not a very rare condition; on the contrary, it is unfortunately a quite common disease. I would ask, then, considering the character of the term carcinoma as a noun of multitude, if this classification of Miller might not also be dispensed with?

Osteo-Cancer.—This is another classification; it is used as a sign of the malignant ulceration of bone. The only objection to be urged against the term is, that it makes another unnecessary class. We would scarcely suppose that an ulceration could occur as the primary lesion. If, then, it is a secondary condition, it is only an attendant phenomenon, and can have no claim to the distinction of special classification—the disease, or rather the condition, would be carcinoma in a state of ulceration, and it seems to me, if we should describe it as ulcerating osteo-carcinoma, we would give it all proper signification, while, at the same time, we should make still one less of these special confusions.

Synonyms.—To these, when learnedly made, no objections can perhaps, be urged. So many names for one thing is, without doubt, confusing enough to the student; but then, this is a matter which time and study make familiar to him, and more than this, reasonable and proper.

I would have my reader, then, infer that if, in the study of the malignant disease of the jaws, he will agree to throw entirely aside the unjust nomenclature which so surrounds the subject, and approach the study on general principles alone, he may, from a single stand-point, at a single glance, take in the whole of the subject.

And first, to return to what has been alluded to as the persistent type—medullary matter. This form of carcinoma is named from its resemblance to brain substance. Its synonyms are many, generally good, but a little confusing when associated with degenerating sarcoma; but on this point I hope the student is sufficiently fortified.

I have remarked that one classification made by Miller, of the cancerous tumors of the jaws, is osteo-cephaloma: this is a synonym of medullary; the only form of cancer of the maxillary bones, with the exception mentioned. Now in Mr. Miller's book is a comparison which he has drawn between osteo-sarcoma and osteo-cephaloma; the comparison embraces ten conditions. If the reader will closely study them he will truly have his subject in a nutshell.

1. Says Mr. Miller: Osteo-sarcoma is seldom found prior to adult age; osteo-cephaloma may occur at any period, and is as frequent in the adolescent as in the adult.

2. Osteo-sarcoma is usually attributable in its origin to external injury. Osteo-cephaloma is most frequently of spontaneous origin.

3. Osteo-sarcoma is slow and gradual, and more or less uniform in its growth. Osteo-cephaloma is much more rapid, and tends to enlarge unequally, growing chiefly at those points where there is least mechanical resistance.

4. Osteo-sarcoma is usually almost, and sometimes altogether, painless, unless when some nervous trunk or plexus is compressed. Osteo-cephaloma, from the first, is attended with severe lancinating pains.

5. Osteo-sarcoma is firm, and yields but little to touch, even undue pressure is scarcely painful; and obscure crepitus is often felt. Osteo-cephaloma is soft and elastic from an early period; the shell of bone and all other original texture soon becoming merged in the medullary formation. It is elastic, and affords no crepitus when an original tumor, and pain is aggravated by compression.

6. Osteo-sarcoma entails but little disorder of the general health. Osteo-cephaloma is attended by marked cachexia, even from the beginning.

7. A casual abrasion of the skin, or mucous membrane investing an osteo-sarcoma, shows a simple character, and may be brought to

heal under ordinary treatment. A similar breach in the surface of an osteo-cephaloma does not heal, but widens more and more and becomes the site of fungous protrusions.

8. Osteo-sarcoma does not invade the neighboring tissues, but pushes them aside by its expansion, and abides within the bone in which it was developed. In the upper jaw, for example, it remains limited to the expanded confines of the antrum, and at those points where the bony and even membranous parietes are deficient, there is no ulceration followed by fungous protrusions, but only a moderate increase of growth in a lobulated form, with or without a rawness of the surface. Osteo-cephaloma, on the other hand, pushes no texture much aside, but early involves all; the antrum is soon passed beyond, and the base of the cranium is affected even before much show has been made externally. Whenever deficiency of the investing texture occurs, ulceration and fungous growths are sure to follow.

9. Osteo-sarcoma long continues in the occult condition. Breach of the surface, when it does occur, does not extend rapidly, and evinces no tendency to malignity of character. The discharge is purulent or puriform, not profuse. There is no tendency to hemorrhage unless by accidental injury, and then it is slight, and easily controlled by pressure. Osteo-cephaloma soon passes from the occult to the open stage. The ulcer spreads, and is obviously the seat of malignancy. Discharge is profuse, fetid, and bloody. Hemorrhage is not unlikely, of spontaneous origin, and little amenable to control.

10. Osteo-sarcoma does not spread, either by contiguity in the tissue, or remotely by the lymphatics. Osteo-cephaloma does both; at an early period the lymphatics are manifestly and hopelessly involved.

These comparisons by Mr. Miller are very happy. The reader must not forget, however, the tendency of sarcoma to pass into carcinoma, and that there is, very frequently, a period in the history of the former in which it is almost impossible to say whether the simple or malignant structure predominates. The comparisons refer to marked conditions in the two diseases,—that is, true and unmixed osteo-sarcoma and decided osteo-carcinoma or cephaloma.

Practically, says Mr. Miller, it is of the utmost importance that we should be able to distinguish between the two diseases: each is of not unfrequent occurrence, and each requires distinct rules of treatment.

Osteo-sarcoma admits of operation to a late period; its extirpation may be fearlessly attempted with a good hope of success even after the tumor has an enormous bulk, and experience has shown that the operation, though it may be bloody and severe, yet seldom terminates but in a fortunate issue.

Osteo-carcinomatous tumors are, on the contrary,—I would speak my own experience if I were to say,—not at all amenable to treatment of any kind. Miller thought they might be operated on at an early period successfully, but I must say (and clinically I have seen a great deal of this disease) I never saw one cured. This assertion implies, however, that the diagnosis has been correct; there are so-called medullary cancers cured every day. Cancerous deposits seem so evidently the work of systemic conditions that when you remove a part containing the localized disease, you seem but to have exposed the conduits which are engaged in bringing to the bulk fresh material: you cannot get beyond the disease with your knife; all adjoining parts are more or less infiltrated with the materiæ morbis.

"I entirely differ," says Mr. Hancock, "from Mr. Stanly and Mr. Liston, that medullary carcinoma commences in the antrum of Highmore and extends backward to the pterygoid process; but, on the contrary, from what I have observed, I firmly believe that the disease commences in the cancellated structure of the body of the sphenoid bone and bones at the base of the cranium, and that, however early we may perform the operation, we never succeed in eradicating the mischief, which is sure to return at a longer or shorter period, according to circumstances."

It strikes me that if Mr. Hancock had only for one moment considered the constitutional relations of cancer, he need not have found himself in dispute with his illustrious peers. For my own part, I know that medullary disease does begin in the maxillary sinus, for I have over and again seen such cases, and so also may it begin, as location is concerned, almost anywhere else about the body; the tumor is not the disease, but only the local expression of it.

But however this may be, I quoted Mr. Hancock's expression only as it is indicative of a general experience of the difficulty of getting away by operation even all of what is apparently the local disease; and how could it be otherwise, seeing the tumor is not encysted, being rather an infiltration, as it were?

What then is to be done in this condition? I can only answer, let every man use his best judgment. We know the history of the

disease: that it tends to fungoid conditions, that it becomes so offensive as to make the patient not only disagreeable to his friends but also to himself, that it is associated with most unbearable pain, etc. We may feel ourselves justified in operating for a twofold reason: first, that we may give to the patient temporary relief; second, with the hope that the reappearance may be in some internal situation, rather than the site of removal; thus at least putting out of sight a disgusting mass which it can be of little use to have under manipulative control.

There are, however, the following general indications which should always be taken into consideration, and which, being met, may possibly result in good to the patient:

1st. As the disease is due to or accompanied by perverted nutrition, every effort should be made to remove any derangement in the nutritive organs, while the general health should be cared for through the generous use of rich diet, tonics, and alteratives.

2d. To remove or check local irritation.

3d. To continue the constitutional treatment through all stages of the disease, not neglecting the quieting assistance of the opiates.

4th. To operate early, if at all, provided the disease presents such conditions as to warrant interference.

5th. To select such means for its removal as will be likely to produce the least irritation.

Professor Smith thinks the greatest amount of good is to be gotten from the chalybeates. He recommend's Vallet's mass in doses of from five to ten grains three times a day. In one case, he says, in which he was consulted with a view to operating, and declined on account of the rapid progress of the disease, he suggested the use of Vallet's mass conjoined with the application of the powdered carbonate to the sore, and the patient lived for eight years without the disease having made any very great progress. Justamond, of London, says Dr. Smith, gave from sixty to one hundred and twenty grains of the ammonio-chloride per diem; while Carmichael, of Dublin, expresses himself as having derived much benefit from washing ulcerated scirrhus with a solution of sulphate of iron.

Chloride of zinc and solutions of the salt are favorite preparations. I believe, from what I have seen, that if it were possible to cure a cancer by local means, chloride of zinc would prove the most formidable antagonist we could bring to bear against it. Its power to arrest phagedenic action is wonderful. The medicine has more than a cauterant property: it is peculiarly alterative. Judiciously

applied to any indolent, irritable, or bad ulcer, it will be found to tend markedly to a change for the better.

Concerning the use of this agent in cancer, we have many commendations, particularly from European surgeons; but, as can be very readily apprehended, nowhere in the range of its application is more judgment required for its proper employment than here, for it is a cauterant, a stimulant, an antiseptic, and alterative. Dr. Zuerine, of Vienna, relates a case of cancerous ulceration of the septum nasi which threatened to destroy the whole nose; one grain and a half of the chloride of zinc, he says, were dissolved in one ounce of distilled water, and the scabs being removed, the sore was penciled over several times a day with the solution; at the end of a fortnight a healthy granulating surface was found underneath the thick crust which covered the sore, and this being occasionally removed, and the solution reapplied, it cicatrized in five weeks.

Mr. Tuson has published some cases to show the value of certain preparations of chlorine in cancerous affections. In one which he publishes there was an extensive cancerous affection of the right breast and neck, which was treated unsuccessfully for a long time, till a paste was applied, made of one part of chloride of zinc to three of flour; this was well mixed, and moistened with water, and then applied over the ulcerated parts. The zinc was also given internally; half a grain was ordered in a wineglassful of caraway-water every morning. The chloride of zinc paste was applied again, and when the slough separated, the ulcerated surface healed kindly. The cancerous deposition continued for some time, and the dose of the metal was increased to three-quarters of a grain and continued for three months. The improvement, although very striking, was not permanent, as the patient suffered a relapse which ended fatally. The case, however, was sufficient to show that the treatment had made considerable impression on the disease, and especially in healing the open cancer, which Mr. Tuson had found to be the result in several other cases.

The great suffering associated with carcinoma makes necessary the free use of opiates, both locally and internally. Stramonium, belladonna, aconite, opium and its preparations, hamamelis, are highly recommended. As much as twenty grains of sulphate of morphia have been administered during the course of a single twenty-four hours. Injections by the subcutaneous method, where morphia is to be long continued, are now generally resorted to. Batley's solution answers best for this manner of use.

CHAPTER XXVII.

EPITHELIOMA.

In connection with the carcinomatous tumors of the mouth, it may not be out of place to refer to the affection, not uncommon in the oral cavity, known as epithelioma. This is a disease commencing frequently as a superficial ulceration either upon the gums or mucous membrane of the cheek, and implicating by extension the underlying osseous structure. When first observed, the ulcer may not be larger than two or three lines, yet even so small, may be distinguished by the sore being ragged and irregular. If seated upon the gum, examination with a delicate and pointed probe will reveal caries of the bone already in progress. When a diagnosis is doubtful, a few days of ordinary treatment will discover, by its uselessness, the intractable nature of the trouble, and set at rest any doubts.

Epithelioma as situated upon the lower lip is familiar to every one; here seems to be its favorite seat. Commencing as a slight fissure, it runs on to the speedy destruction of the patient, involving in a very short time the whole lip and surrounding parts, or, as in less malignant cases, circumscribes itself in the form of an indurated mass, remaining for a long time, gathering force, as it were, for a final onslaught.

Epithelioma is cancer, but it differs from medullary, as fatality is concerned, in seeming to have primarily but a local signification—at least so it seems to me: left to itself, it will certainly destroy the life of one affected with it; taken in time, I am confident it may be cured. Let me qualify, however: safety through early operation may exist only in the less marked form of the disease. That I have cured epithelioma by operations, I have surviving patients to show. That they have died after operations quite as carefully and judiciously performed, the grave, I am sorry to say, holds examples from me.

When commencing in the skin, epithelioma is apt to present itself in the warty or indurated form; on clean mucous membrane, as an ulcer. Situated upon the lip or anus, having thereby associations

with both skin and mucous membrane, it may present itself in either form, or even pedunculated. When indurated, the virus of the disease seems circumscribed; when ulcerated, it appears to be more or less infiltrated through the adjoining tissues. This relationship of the virus in the two conditions would seem to be proven by the relative success of operations performed upon them; the indurated, particularly the warty, being always the most amenable to treatment. It is generally understood that the edges of an epithelial ulcer are hard and indurated, but this is not always the case, as my own experience has exhibited to me. Indeed, such ulcers are very much like chancres, hard and soft, and would be exactly like them were it not for the difference in the bottoms of the sore, the one being pasty, the other fungous.

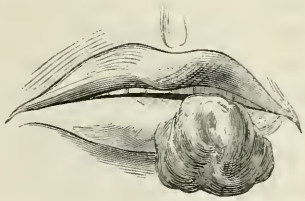
The relative frequency of epithelioma situated inside the vestibule compared with that upon the lip, its favorite seat, is about as three to twelve. The relative danger of positions may be reversed. Situated within the mouth, operative interference cannot be practiced at too early a period; in other situations, circumstances may excuse delays. Operations, to promise any hopes of success, must be thorough; it is not enough to remove the apparent disease, the more of neighboring parts embraced in the incisions the better. Complete excision, when it can safely be practiced, is always the preferable treatment.

Two cases, directly opposite in character and result, will serve as instructive illustrations.

Mr. N., carpenter by occupation, was sent to me laboring under an indurated tumefaction involving a full half of the inferior lip: the tumor was semi-bluish, slightly lobulated and painful, had existed for over a year, was gradually enlarging and softening. The diagnosis of epithelioma but verified the opinion of several other practitioners who from time to time had examined it. Recommended the removal of the whole lip, which was concurred in by the patient. The gap, which was made in the ordinary V shape, great as it was, being carried from either angle of the mouth to the symphysis menti, was filled up without any considerable effort by forcing the cheeks toward the mesial line, retaining them in position by an extemporized Dewar's compressor, and approximating the edges of the wound with the hare-lip pin and suture. The wound united happily by first intention throughout, and although at first the stretched tissues bound the lower jaw so closely as almost to prevent the patient opening the mouth, yet at this date, and indeed

in three months after the operation, so completely had the parts accommodated themselves to the new condition of things that one would almost fail to detect that the natural parts had ever been interfered with. The success of the treatment has been all that could be desired; nearly three years have passed, and there is not the slightest evidence of a return of the trouble.

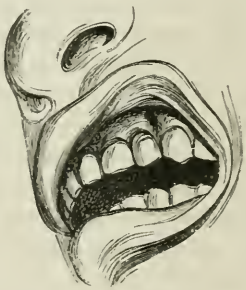
Fig. 83.—View of Case.



Case II.—*Epithelioma of Gum.*—M. G., aged about twenty-one, farmer by occupation, was sent to me about two years back by Dr. Edward Townsend, whose dental patient he was. Dr. T., while treating a bicuspid tooth, remarked at the neck a slight ulceration, but which appearing of little consequence, scarcely at the time commanded more than a passing thought. Attempting, however, at a later period its cure, its obstinacy in yielding excited his suspicions, and being unwilling to assume the trouble of the case, he directed the patient to my care. Examination made on first meeting the patient revealed a small ulcer on the left superior gum between the bicuspid teeth, in size about half as large as the silver three-cent piece, jagged, covered with a whitish gummy secretion, and apparently superficial. The passage of a sharp probe through the center of the ulcer revealed the characteristic carious, softened, and periosteally denuded bone. Satisfied in my own mind of the character of the ulceration, yet unwilling while there might be an unrefuted doubt, however slight, to depress the patient by informing him of the nature of his disease, I placed him under ordinary treatment for a period of two weeks, at the end of which time, finding my experience agree with Dr. Townsend, I laid before him his condition, advising an immediate resection of the affected and adjoining parts. Unwilling to submit, the patient desired consultation, and in turn the advice of every prominent surgeon in the city was obtained. Opinions differing, he, by my advice, submitted himself to various proposed remedies, being treated two weeks by one gentleman, eight

weeks by a second, and nine by a third, the disease progressing, but slowly, all these weeks. At the end of this time I again proposed and insisted upon an operation, informing the patient of the necessarily increased magnitude of the portion of bone and soft parts to be removed; still refusing, I declined to take further responsibility in the case. The patient making me a visit at a later period, I found the ulceration involving the Stenonian duct, and extending from the symphyses to the tuberosity of the bone. At this visit I informed him of the utter hopelessness of any operation for his relief, the disease being too extensive. From this time to that of his death, which happened in a few months, he was in the hands of different advertising impostors, and of the treatment pursued I know, and desire to know, nothing. Whether or not an early operation would have saved this patient from his early death I may not of a certainty say, but from a reasonable experience in the direction I may assert that without the performance of such proposed operation he had no possible chance.

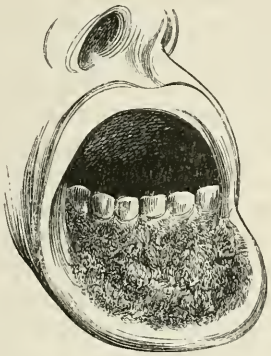
FIG. 84.—VIEW OF CASE AS FIRST SEEN.



CASE III.—Col. W., merchant. Epithelioma involving, when first seen by me, lip, tongue, and cheeks—case hopeless. The disease in this patient began as a minute tubercle just over the genial bodies of the inferior maxilla; thought little about it, only received attention when found ulcerating, such attention, from misappreciation of its character, consisting in the too common application of caustics. Aggravated by such treatment, the ulceration commenced rapidly to spread, defying, when too late understood, every means employed for its arrest. Shortly after coming under my care, the lip fell off in mass, the root of the tongue indurated to such an extent as to interfere with both respiration and deglutition, and the patient, a fine robust man, died from prostration.

It must be clearly seen that whatever chance existed for this patient, it lay not in exciting and aggravating by caustics, but in the complete removal of the primary tubercle with all the immedi-

Fig. 85.—View of Case.



ately adjacent tissues. That error, if error there be, shall be on the safe side, I make it a rule always to cut away, with a large margin, such tubercles: if they are benign, little harm has been done; if they are malignant, the free removal has perhaps saved a life.

Epithelioma when involving only a part of the tongue, and when markedly circumscribed, may be operated on with a warrantable degree of success; it is better in these cases, particularly if the induration is at all extensive, to amputate all that portion of the organ in mass associated with the disease; for this purpose no better instrument can be employed than the ecraseur of Chassaignac; no hemorrhage attends the operation, and if the system has been properly prepared, the subsequent inflammation is not of any considerable importance. When, however, not only the tongue but neighboring parts are involved, any operation promises very little,—one ulcer or tumor may be managed, two seldom or never. (See *Diseases of Tongue.*)

The term epithelioma is not, however, to be received as necessarily equivalent to a dangerous disease. In the work of Professor Henry H. Smith, on Surgery, occur the following passages on this subject, which can only be read by the student to his profound advantage:

"When from any cause irritation is developed in the skin, its appendages, or in the mucous membranes, the normal action that daily

casts off dead epithelial cells is increased, and may be followed by hypertrophy, or by such thickening, degeneration, and ulcerative action as will materially modify the normal condition. Tumors thus formed on the skin and mucous membrane by the accumulation of a largely increased number of epidermic and epithelial cells, united together by filaments of fibrous tissue, and furnished with blood-vessels, as the result of the organization of the fibrinous deposit, have been called, by Hannover, Epithelioma.

"Epithelioma vary considerably in appearance. If the result of the irritation caused by pressure on the skin, they constitute Corns of common language, and are a true hypertrophy of the epidermis. When the epidermic cells are closely packed together by pressure, they create Hard corns; when the cells are more distinct and disposed to a papillary arrangement, owing to the presence of a greater amount of moisture, they form Soft corns.

"When the epidermic cells accumulate upon a surface in consequence of the increased action that follows a local congestion or simple redness, they form the varieties of skin disease known as the Squamæ or Scaly Class, as Psoriasis. Condylomata and Venereal warts are analogous tumors, usually found on the points where the skin and mucous membranes blend, as the corona glandis of the penis, the vulva, and anus, or about the lips and nostril. Both venereal warts and condylomata are developed apparently in some instances in consequence of a peculiar contamination, as has been described under the head of secondary syphilis. When closely examined, condylomata are found to be formed of a congeries of papillæ, sometimes flattened on the top, while others have fissures that lead down to a common stalk. When small, condylomata are mostly composed of epithelial scales, but in the larger growths there is more or less areolar tissue supplied with small blood-vessels. A vertical section exhibits a vascular loop surrounded by a basement membrane, external to which are layers of epithelial cells that vary in thickness.* Common skin Warts, as often seen on the hands, belong strictly to the class of epithelioma, being formed of epithelial cells not compressed, and of a papillary form. These are mainly the result of some local irritant that increases, on a circumscribed spot, the epidermic cell action. All these tumors, when inflamed, may undergo fatty degeneration, softening, and ulceration, creating ichorous and irritating discharges, and sympathetic irritation of ad-

* Bennett's Lectures.

jacent lymphatic glands, those of the groin occasionally enlarging from irritated corns on the toes, and those of the axilla from inflamed warts on the fingers.

"The greater vascularity of mucous membranes modifies the formation of epithelioma in this tissue, the induration or small scaly wart degenerating and ulcerating, and creating, through inflammatory action, more or less induration of the parts immediately adjacent.

"When any irritation develops this action on a mucous membrane or where mucous tissue and skin blend, it is apt to create an ulcerated epithelioma that is difficult to heal. This variety is found on the margin of the lip, in the alæ of the nostril, in the inner canthus of the eye, after fissure of the nipple, on the tip and margin of the tongue, on the os uteri, as well as on the vulva, prepuce, and anus. The rodent skin ulcer of the scrotum, and lupus are also assigned to this same class of growths. When in these localities epithelioma is developed, it commences as a flattened induration or scale, which is followed by a slight crack or fissure, and an ichorous watery exudation that is irritating. Hence increased action, then ulceration, with induration of the margin, so as to give an apparent depth to the ulcer, which is, in reality, quite superficial. The pus from this ulcer being small in quantity, soon dries and forms a scab or scale, which, being accidentally removed, is followed by slight bleeding and another crust, the reproduction being in this manner continued for months. When these ulcers are examined microscopically they present on the surface masses of epithelial cells in all stages of development. The lymphatic glands near these ulcers often enlarge, and are secondarily affected, in consequence of which many writers regard this variety of epithelioma as analogous to cancer. That epithelioma may assume the cancerous peculiarities under some circumstances, is beyond question; but it is equally certain that it is erroneous to regard all epithelioma as cancerous, some of the cases being only evidence of disordered epidermic and epithelial cell action, and capable of perfect cure.

"The opinions of pathologists, on the identity of epithelioma and cancer, are, however, yet much divided, Paget, Velpeau, and Schuh regarding it as cancer, and calling it epithelial cancer, while Lebert, Hannover, Bennett, and Lawrence deny its cancerous nature.* Lawrence thus arranges the arguments:

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* Lawrence on Cancer, 1858.

I.—*For Epithelioma being Cancer.*

"1. Its infiltrating character.
"2. Its tendency to infect the lymphatic glands.
"3. Its tendency to recur after removal.
"4. Its fatality.

II.—*Epithelioma is not Cancer.*

"1. From the excessively rare occurrence of consecutive deposits.
"2. Its anatomical structure.
"3. The absence of primary cachexia.
"4. Its frequently local origin.

"A careful study of the question, seconded by some experience, induces me to regard the question as thus correctly stated:

"1st. Epithelioma exists as a distinct growth, characterized by epithelial cells, as in corns, thickened skin, horns, warts, etc.

"2d. These may become the seat of cancerous action, and run the course of cancer to degeneration, though in the least marked form, being then well designated as 'cancroid.'

"3d. There is a cancer of the skin and mucous membranes, originating in the follicles, that presents the usual elements of cancerous action elsewhere, which yet presents epithelial cells, and the other normal elements of the tissue invaded.

"4th. Simple epithelioma is to be regarded as really a hypertrophy which, when inflamed or irritated, ulcerates and undergoes the usual changes of healthy inflammation.

"When, as is sometimes seen, a sebaceous follicle participates in the increased epidermic cell action of epithelioma, it results in a thickened growth that is so indurated as to be called a Horn. Some of the instances of this development, and especially one well known to visitors in Paris, on the forehead of a woman, have attained several inches in length.

"Anatomy of Epithelioma.—The cut surface of an epithelioma is generally grayish white in color, and the texture is solid or semi-solid, quite friable, and does not generally yield anything resembling the 'cancer juice.' Microscopic examination shows infiltrated among the textures of the part affected, great numbers of cells of irregular shape, $\frac{1}{200}$ to $\frac{1}{1200}$ of an inch in their long diameter, which more or less closely resemble normal epithelial scales; whence the name of the disease. Besides these free nuclei, the peculiar bodies, the

'globes épidermiques' of Lebert, and the 'laminated capsules' of Paget, can be observed, as well as spindle-shaped cells, which are often found in considerable number, according to Wedl, who asserts that the idea that epithelioma exhibits no forms which cannot be referred to the epithelial type, is based on the most imperfect research.

"DIAGNOSIS.—A clinical diagnosis can generally be made before the removal of the tumor, if the age of the patient and the papillary character of the growth, as well as its locality, be regarded. Occasionally ulcerated scirrhus of the skin and mucous membranes, and perhaps lupus, may be confounded with epithelioma. Both these errors will, however, at once be rectified after the removal of the growth and a study of its minute anatomy, with the assistance of the microscope.

"TREATMENT.—Epithelioma demands varied plans of treatment, in accordance with the nature and locality of the growth. Hard corns and the scaly varieties are often cured readily by protecting the part from pressure, or by softening ointments and plasters. Condylomata and venereal warts may be destroyed by chromic or nitric acid or powerful astringents. The same treatment is applicable to warts on the hands or generative organs, not the result of syphilis, being in the latter case consequent on inattention to cleanliness or the presence of acrid discharges. The ulcerated variety will generally require such treatment as is applicable to cancer of the skin, under which head it will be stated. Epithelioma of the canthus of the eye, alæ of nose, and the superficial variety seen on the lip, os uteri, etc., is best treated by the repeated application of the dry, powdered sulphate of zinc, as proposed by Simpson, of Edinburgh, the application being repeated until a healthy surface is produced, and then dressed as a healthy ulcer. In the simpler forms seen in the os uteri I have obtained much success from this treatment. The addition of powdered gum arabic will dilute the application when desired, and also favor its adhesion to the surface."

PLATE VIII.

APPEARANCE AND POSITION OF SOME OF THE TUMORS SEEN ABOUT THE NECK.

FIG. 1.—A large Cystoma of the right parotid region, caused by the development of a sebaceous follicle in consequence of a blow upon the part. Commencing as a lump the size of a nut, this tumor gradually increased to nearly the size of the head; gave exit at one time to sebaceous matter; had a broad base; was nearly immovable; had the veins enlarged upon its surface, and showed a small ulceration in front, from which fetid, acrid, and bloody sanies had escaped. As the tumor enlarged the jaw became closed; sensation of the face diminished, and there were all the other symptoms due to pressure on the vessels and nerves of the part. The tumor differs in appearance from scirrhus of the parotid gland in its size and period of development. It was readily removed, and is represented as an example of one of the class of tumors of the parotid region not involving the parotid gland.—*After Auvert.*

FIG. 2.—Large Adenoid Tumor of the Neck dependent on degeneration of the lymphatic glands of the neck. Arising as a small swelling caused by an enlarged gland below the angle of the jaw, it gradually increased until it occupied the entire side of the neck, involving many glands, and reaching from above and behind the ear to below the clavicle, so as to turn the head to the opposite side. Its appearance was that of an irregularly lobulated mass: it was unaccompanied by pain, was perfectly firm and hard, and gave no sense of fluctuation at any point. Under the use of chloroform it was successfully removed by Mott.—*After Mott.*

FIG. 3.—Appearance of an immense Adipose or Lipomatous Tumor of the Neck. This tumor was not painful; had no pulsation; was formed of numerous large lobes, with the superficial veins distended over them, and was attached to the neck by a large pedicle which extended from the angle of the lower jaw on the right side down to the sterno-clavicular articulation, its weight being so great that the patient could hardly retain the erect position. The tumor was found to be covered by a strong capsule formed of the surrounding cellular tissue, and to have originated in a hypertrophy of the surrounding adipose tissue.—*After Auvert.*

FIG. 4.—A large Cystoma of the left Parotid and Submaxillary Regions, which was to the touch semi-elastic, unequally lobulated, and due to a chronic irritation of one of the sebaceous follicles, the duct of which had become closed, and thus caused a retention and degeneration of its secretion.—*After Auvert.*

CHAPTER XXVIII.

TUMORS OF PARTS ASSOCIATED WITH THE MOUTH.

The sebaceous, the cystic, the fatty, and the glandular tumors are those most frequently found in association with the integuments.

The first, the sebaceous, are perhaps the most common, and are as simple in nature as they are easy of cure. As the result of a blow or other cause, the orifice of one or more of the ducts of the sebaceous glands becomes obstructed; the secretion continuing and having no outlet becomes necessarily accumulated; hence the gradual expansion of the duct and formation of a tumor. As this tumor continues to enlarge it becomes more and more solid, the result of the absorption, or, if not this, at any rate the disappearance of its more liquid contents, until finally, to the touch, it becomes springy and elastic. A section of such a tumor exhibits a delicate cyst wall or envelope, and cheesy or semi-fatty contents; it is seen to lie in the integument as distinctly as a walnut lies within its hull.

Sebaceous tumors are found of every size, varying, indeed, from a hazel-nut to a fœtal head; they are generally spheroidal in shape, but frequently, because of influences exerted by neighboring parts, become changed, even to a lobulated character.

The diagnosis of a sebaceous tumor is generally not at all difficult —it rolls under the touch, can be circumscribed by the grasp, has a detached feel, as if confined to its place alone by the skin; the tissues enveloping it are perfectly healthy, while, however large it may be, no evidences are given of constitutional association. Exceptions, however, exist to this simplicity in some special cases, as, for example, where the presence of the tumor has excited inflammation in the surrounding parts, thickening the cyst and forming attachments, or where the attenuated skin has ulcerated, or where the contents of the cyst has degenerated.

Sebaceous growths are only to be gotten clear of by operation. In many cases it is only necessary to make a sufficient incision in the skin, and the tumor can be enucleated, just as the crystalline lens is

removed in the operation for hard cataract. In other cases it is necessary to incise the tumor through its center down to the base; this exposes the cyst or sac, which is to be dissected away. In instances of moderate or large growths it is the practice to commence with an elliptical incision, making the skin removed correspond with the requirements of the parts after the tumor shall have been taken away. In doing this it will be found much better to have too much than too little integument—even very large flaps will be found soon to accommodate themselves to the parts beneath.

FIG. 86.—SMALL SEBACEOUS TUMOR, SHOWING ITS SACCULATED CONDITION.

The contents of sebaceous tumors, while really of a common character, yet vary very much not only in appearance, but in consistence. Yet, whatever this consistence, the springy, elastic character, as the touch is concerned, is preserved. Prof. Gross, in his "System of Surgery," describes such tumors as of soft and doughy consistence, giving this as one of the diagnostic features. The observation certainly differs from my own, and I am at a loss to explain such difference. These tumors, while very frequently multiform when appearing upon the scalp, where they are known as the common wen, yet seldom appear but as single upon the face.

Sebaceous tumors have little vascularity, the supply of vessels being confined to the sac, which, as will be inferred, is the attenuated duct and glandular substance; hence the growth is of very slow character. Little or no pain attends the development, and they are entirely devoid of danger, as any tendency to malignant degeneration is concerned. The sac, because of attachments which it has formed outside, is generally, on such aspect, rough and cellular-looking; on the inner face, on the contrary, it is smooth and glistening.

Cystic Tumors.—Cystic tumors, or, more justly speaking, cellulose tumors, are of not unfrequent appearence in the cheeks. They might be described as an hypertrophy of the subcutaneous cellular tissue, and would be very well represented by esteeming them as made up of a number of air or serum injected cells, grouped together, and limited by the adjacent fascias. The skin above such tumors is always attenuated and generally discolored, even to an approach to purple, looking, indeed, as if just ready to slough away, and yet being tenacious of its vitality to an extent quite wonderful. Similar tumors are occasionally found in the substance of the lips, but are much more apt, in this situation, to be made up of a single cell rather than many. In origin they may be said to be idiopathic, coming, as it were, of themselves, and occasionally disappearing as spontaneously, having, in the interim, failed to respond in the slightest degree to treatment.

These tumors, unless in situations which permit of the use of the knife, which is their effectual cure, are found very difficult to manage; the only thing that ever seemed to me of the slightest service was the daily smearing of the surface with creasote ointment, and this practice will be found unsatisfactory enough. In their treatment I have broken up the cells, have laid the tumor open in bulk, and stuffed the cavity, have used every conceivable kind of an injection, and then, completely discouraged and baffled, have left the case to nature, which, after six months, or it might be a year or more, would finally effect a cure.

The most common seat of such tumors is over the line of the Stenonian duct; and, if I had not succeeded in satisfying myself thoroughly to the contrary, I would have to believe that some connection existed. Whether cured by nature, with or without assistance, they are peculiarly liable to recur. I have known them appear and disappear as many as half a dozen times. They seldom rise much above the level of the cheek, are oblong in shape, and, indeed, now that the idea just strikes me, look more like a varicose vein with hypertrophied valves than anything else to which perhaps one might compare them.

Another kind of cystic tumor, appearing in the integuments of the face, occasionally met with, may be compared to a cyst of cartilage. Such cysts seem to prefer as a locality the side of the nose, and when in this situation are connected with the lateral cartilages. If opened from beneath, they will discharge, on compression, a puslike fluid, but, in a very few minutes after such pressure is removed, will refill, or

will, at least, reassume their original form, recovering, perhaps, by the elasticity which resides in them

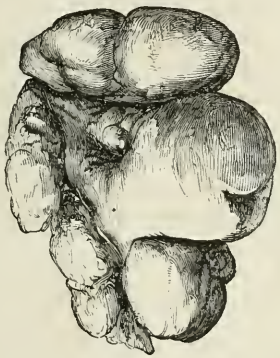
Another, and the only other situation in which I have met with such tumors, is in the substance of the lip; but here they more resemble fibro-cartilage than when upon the side of the nose. Extirpation by the knife is the proper treatment, although it not unfrequently happens that a cure may be effected by cutting into the cyst, scarifying its walls, and stuffing with medicated lint; the tinct. of iodine being used first, and alum-water and capsicum after.

Fig. 87.—Cartilaginous Cyst.

Fatty Tumors.—The fatty tumors are much more common to the posterior and lateral aspect of the neck than to the face. Wherever appearing, however, they are recognized by their extreme slowness of growth, by the tissues overlying them being unaffected, by the absence of pain, and of constitutional association. To the touch

they are not so diagnostic, being at one time springy and elastic, at another dull and doughy. Being an hypertrophy of the common fatty tissue, they are not distinct and circumscribed as the sebaceous, consequently are of broader and more diffused base; such tumors may or may not be sacculated, such sacculation, however, referring to a very imperfect cyst even when any signs of one may be present. Fatty tumors seldom manifest any tendency to degeneration, troubling more from a constantly increasing bulk, and the annoyance of their presence, than from any real harm inflicted. Fig. 3 in the plate represents a most unusual form of the lipomatous tumor, a case such as is seldom met with. In this instance the growth, from its very weight, has become pedunculated, the vascular enlargement being a natural and simple result of mechanical interference with the circulation. Fatty tumors are only to be treated by the knife; it is simply a waste of time to try other means.

FIG. 88.—LOBULATED LIPOMATOUS TUMOR—AFTER MILLER.

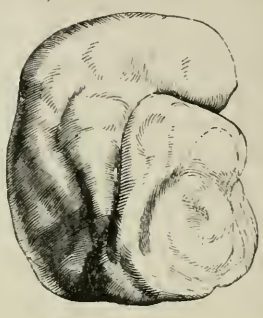


GLANDULAR OR ADENOID TUMORS.—Glandular tumors, represented in the plate, Fig. 2, belong markedly, although not exclusively, to the scrofulous condition, being found, most generally, upon persons so affected. These tumors are generally situated upon the side of the neck, involving one or more of the superficial ganglionic chain. In undecided cases I have known them of such torpidity that two or three years would scarcely suffice to develop them to the size of a walnut, while, in other cases, the enlargement will be so rapid that a very few months may be sufficient to obtain the prominence marked in the plate. Unlike the previous classes of growths, the adenoid are very susceptible to constitutional and local treatment, being, in

such manner, quite as frequently caused to disappear as by the use of the knife.

Fig. 89.—Microscopic Structure of an Adipose Tumor (Bennet).

Fig. 90. — View of Fatty Tumor removed from under the Tongue (Liston).



When appearing upon the face, such tumors imply the enlargement of the buccal glands; in these instances they are not so apt to have the scrofulous association as when found upon the neck. In considering such growths, we are primarily to investigate the cause or causes exciting to their development. Scrofula, the common cause, has been, to some extent, considered in another part of this work; its general recognition as a dyscrasiac disease suggests the necessity of such a course of medication as shall tend to restore the lost tone, and build up the system at large; hence the use of tonics so freely prescribed in such connection. Regarding the local remedies to be employed, a common preference seems to be given to the iodine in tincture. Overstimulation, however, it is not to be forgotten, is quite as bad, or even worse, than no stimulation at all, and, by a too free use of this agent, even more harm than good can be done. Harmony in the system at large being secured, it will be found to need very little local stimulation to provoke absorption in the tumor; hence a philosophical treatment of such cases considers not only medicaments proper, but the bath, dress, food, exercise, etc.

A local treatment to be used in very indolent growths, consists of equal parts of the belladonna and mercurial ointments. Such an ointment, in my experience, causes these tumors to absorb very rapidly, or otherwise to degenerate into pus. I have used this combination in many cases with the most satisfactory results.

Another mode of treatment is by the blister. For this purpose the cantharidal collodion will be found admirably adapted. Blisters

should be in proportion to the size of the tumor, never covering more than an eighth or quarter of its free surface.

In cases where it may be thought preferable to use the knife, should the tumor be upon the face, the incisions are to be made in the line of the underlying muscles, thus insuring as little deformity as possible from the scar.

Adenitis from a syphilitic association may yield tumors of the cervical and buccal glands. A diagnosis in these cases is secured from the history of the case, or, if this is not to be procured, an enlargement will always be found to be associated in the posterior cervical chain. This is a most diagnostic sign, and will seldom mislead.

ACCIDENTAL TUMORS.

Tumors of the parts we are considering, which might be termed accidental, are the erectile, the lepidoid, the verrucous, the keloid, and the horny.

Angionoma, Vascular, or Erectile Tumors.—Under this designation are included nævi materni, or mother marks, and the venous, arterial, and capillary growths.

Nævi, as suggested by Professor Smith, cannot always come justly under the designation of tumors, from the fact that they frequently exist without apparent elevation; situated in the skin, yet producing no visible thickening of it. These marks are of very various size, form, and color, being sometimes found several inches in length, and again as mere spots. In form they may represent certain familiar objects, as fruits, animals, etc. The color of them, generally, some shade of red, varies from the arterial scarlet to the dull purple of a venous congestion. Nævi, even although to the eye they may not in many instances appear vascular, yet certainly differ only in degree from the telangiectasis, being commonly capillary hypertrophies, as is sufficiently witnessed when wounds occur in them. That such vascularity does not, however, shade off into the adjoining tissue is sufficiently well recognized; indeed, just the contrary, the connection being indeed very limited. Such tumors are supplied by two or three large vessels, the hypertrophy of whose radicles may, for practical purposes, be esteemed as constituting the tumor; hence, in operating on such growths, if the incisions are made wide of the tumor, there is found no more perhaps than ordinary hemorrhage—one or two vessels alone demanding the ligature.

Arterial Tumor.—This is a form of the erectile growths which

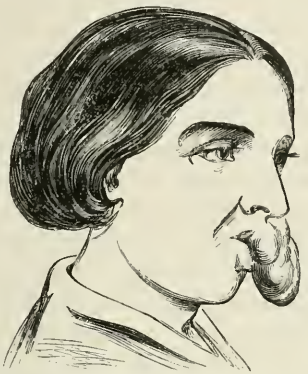
has an individuality, inasmuch as it consists fairly of a congeries of vascular twigs, held together by the more or less imperfect remains of the associated skin and cellular tissue. It is not, as has been suggested, an aneurism, but is rather a simple enlargement of terminal vessels, proven from the fact that such enlargement accompanies the vessels of supply for a greater or lesser distance; that it differs, however, from the nævi, just described, few are prepared to admit. It is, perhaps, a formidable nævus, but nothing more, both being, in varying degrees, erectile tumors.

The origin of these growths, while in many instances referable to local injuries, yet in most cases are fairly to be presumed of congenital character. It is very true that they may appear even later in life, yet the impress existed, although it might have been but a little red spot not larger than the head of a pin, and may have entirely escaped attention.

The growth of such tumors is markedly variable. I have met with them where twenty years seemed scarcely to have changed their character, while in other instances a single week has exhibited alarming progress. In some cases the attenuation of the coats of the vessels is so great that one might well imagine he can see the flow of the blood, while in other instances, a hypertrophy of the associate tissues is so marked as to comparatively solidify the part. In color the arterial tumor will also be found to vary, the shading being influenced by the conducting facility of the veins which are to pass off the circulation. Pulsation exists in many of the cases, and is synchronous with the ventricular systole. To the touch, the tumors are soft and doughy, being made to almost disappear under pressure, yet filling up the moment such pressure is removed; they have no definite form, the outline being modified by circumstances, of which we know nothing. One marked diagnostic sign of such tumors is the effect produced on the size by the condition of the circulation; verat. viride, or digitalis, by lowering the action of the heart, will almost cause those of moderate size to disappear. Even the quietude of sleep and recumbency markedly affect them. Passion, on the other hand, excitement, or any mental emotion disturbing the pulse, will cause them to enlarge, even in some instances to bursting, such enlargement being most marked in cases where a state of atrophy characterizes the connective tissue. The common danger from these tumors is ulceration, which, in many instances, resulting in severe hemorrhage, has gradually, if not suddenly, exhausted the patient.

THE VENOUS TUMOR.—This is still another form of the erectile growths, differing, however, from the one just described, in the fact that the venous, rather than the arterial, twigs, are in a state of enlargement. A description of the one is a description of the other, saving in the matters of color and pulsation, the latter being generally dark, almost to a dull purple or grayish-black, and of course deficient in pulsation. Like the arterial, the venous tumors are sometimes slow of growth, at other times rapid; they appear without assignable cause, other than the congenital impress.

FIG. 91.—VENOUS TUMOR.



Treatment.—Nævi are treated on a common principle; by amputation with the knife, by strangulation, by compression, by injection, and by the application of caustic remedies.

Excision is chiefly confined to small tumors, before, as remarked by Prof. Gross, they have acquired much functional activity, or given rise to any marked enlargement of the neighboring arteries. In these cases excision is the easiest and most rapid way of getting clear of them. The general experience to cut as wide of the growth as convenient is the principal rule; as the vessels of supply are cut, an assistant compresses them with thumb or finger; and while such vessels are frequently very formidable looking, yet it may happen that when the tumor is entirely away, not a single ligature shall be required. Should the hemorrhage not, however, cease, it will be found the easiest matter to catch them with the forceps or tenaculum, and throw a ligature around them.

A removal effected, and the bleeding controlled, nothing remains but to close the wound with a few stitches of the interrupted suture, and to support it with adhesive strips.

Strangulation, the most common mode of operation, is effected by transfixing the tumor with one or more ligatures, and thus sloughing it away. As a general rule, it will be found necessary to transfix skin as well as tumor; but should cases present where the overlying parts are healthy, then a crucial incision may be made, and the flaps laid off before such transfixion; the tumor removed, the flaps are laid back in place, and dressed secundum artem.

Compression applies to pressure however made. Take a piece of ivory, metal, or other convenient material, adapt it to the part, and confine by means of bandage or adhesive strips. This mode of cure is rarely applicable, being used only over bony surfaces, and where the tumor is quite small. A practice, which in one instance, where the tumor was situated upon the finger, answered a satisfactory purpose, consisted in the daily application of tinct. iodine four times the officinal strength, together with the use of an india-rubber ring. Collodion, daily applied, has been recommended

Injections have many advocates: of agents thus used, the principal are iodine, Monsel's solution, nitric acid, and creasote. Such mode of treatment is always, however, more or less risky, and is not to be commended. The practitioner disposed to try it has only to use the ordinary subcutaneous syringe, break up, with its point, the structure of the tumor, or some portion of it, and follow with the injection. Several cases of death are on record from such injections.

Caustic remedies, used to destroy such tumors, are of various kinds,—the Vienna paste being mostly preferred; this is the potassa cum calce of the pharmacopœia: it is used by making an application of from ten to twenty minutes, succeeding it with an emollient poultice.

Another method is to paint the part with the blistering collodion, and, after the cuticle is raised, apply crystals of the chloride of zinc.

Landolfi's caustic is thus composed:

R.—Bromin. chlorid. 3 parts;
Zinci, 2 parts;
Antimon. I part;
Pulv. rad. glycyrrh. 1 part. M.

Still another is called Fell's. It is composed as follows:

R.—Pulv. rad. sanguinar. Canaden. ℥i;
Zinci chl. ℥ij;
Aqua, f℥ij.

This is mixed, forming a thick paste.

The application of Dr. Mackey, of Edinburgh, is as follows:

R.—Hydrarg. bichlor. 4 parts;
Collodion, 30 parts. M.

Paint the part thoroughly; four hours afterward apply a warm-water dressing; the eschar will slough out in from three to six days.

In the application of any caustic, trouble, more or less severe, from a resulting inflammation, is always to be anticipated; this every patient, or the friends, should understand, as it is impossible to know just how a case shall come out. After the use of a caustic, and the slough of the part, the resulting wound is to be esteemed and treated as a simple ulcer.

Starvation is still another method of treating the erectile growths. This consists simply in finding the vessel or vessels of supply, and cutting off the circulation by ligation; this mode has many advocates, and is certainly well where the vessels are in a position to be conveniently operated on.

The seton is still another mode. This is introduced by threading the needle with tape or other material, and passing it beneath the growth. The seton, whatever the material, should be as large, if not larger, than the needle which carries it; thus, by the pressure secured, guarding against hemorrhage.

In considering the treatment of nævi, it is not to be forgotten that there are cases which, if left to themselves long enough, might effect self-cure. Young children, afflicted with nævus, are hurried to the surgeon, under the impression that it must necessarily spread, and that therefore the sooner the disease is removed the better. Such haste will not always be found necessary, or even prudent. For a short time after birth a nævus may continue to grow—for several weeks, perhaps, then it may cease to enlarge. If it is of a simple cutaneous variety, it may become the seat of ulceration; this may spread, but it will destroy the nævus. In other instances, a nævus, after growing to a considerable size, will become the seat of atrophy, will dwindle, shrink, and degenerate, until little or nothing of it is left.

Lepidoid Growths.—The lepidoid growths are generally multiple, inferred, primarily at least, to be strictly epithelial in character, and exhibit themselves as elevated patches of varying size, scattered irregularly over the parts affected, the common localities being the cheeks, nose, and forehead.

The origin of the term, from λεπις, a scale, and δενδρον, a tree, affords the idea of the condition the part presents, simply a number of scattered barklike scales separated by healthy skin. The disease, without any doubt, is most common to persons of sandy and florid complexion, having light or reddish hair, with marked cutaneous circulation.

Appearing first as scales not larger than a pin's head, the disease may year by year progress, until finally the scales which, like all epithelial tissues, have been falling off and renewing themselves, cease to develop, leaving ulcers. The dermis beneath exhibits a granular, glossy surface, looking like limited fungi glazed with lymph; the intermediate skin soon becomes dense and fibro-cartilaginous, and if not cured, cancerous degeneration succeeds.

In the treatment of this condition, the paint, composed of tinct. of iron and quinia, will be found most reliable. If, however, it should not effect an immediate good, it is better to at once dispense with its use, and depend strictly upon constitutional influences. As a common wash or simple source of protection, bran-water will be found very soothing. A local application as follows has also been highly recommended:

℞.—Hydrarg. bichl. gr. i;
Glycerin,
Eau de Cologn. āā ℥ss. M.

Verrucous Growths—Warts.—Warts upon the alæ of the nose are familiar objects to every one. They consist of an hypertrophy of the papillary structure, and are frequently covered with a sort of secondary growth, as in what are known as the seed-warts; the structure is essentially cellulo-fibrous.

Warts are not only objectionable from the stand-point of a deformity they produce, but when situated upon the face seem peculiarly inclined to degenerate, assuming a vascularity which always impresses as threatening. In treating a wart, the practitioner may, if he choose, first apply dilute chromic acid; this, in many instances, will blacken and kill the growth, the tumor sloughing away in the course of five or six days, leaving the resulting ulcer a perfectly simple one. But chromic acid is not to be applied to the vascular wart; on the contrary, if irritable, as generally first seen by the practitioner, they are to be soothed by the most gentle of applications, after which they are be thoroughly removed with the knife—a rule always good in this direction is "Do not irritate." I have

seen many a vascular wart provoked into the most alarming of aspects. A wart, situated upon the face, unless like the simple, hard, insensible excrescence as met with upon the hands, cannot be too carefully or judiciously treated.

KELOID TUMORS.—Keloide, the French term, signifying a disease resembling scirrhus, is the name given to one of the most peculiar and inexplainable of the skin affections. This condition, first described by Alibert, is characterized by nodules, or more generally wheals, scattered irregularly about the body—most commonly, however, confined to the breast, arms, neck, and face. It occurs in both sexes, may appear at any time of life, and is thought to be more common to the black than to the white

Keloid is a disease of the skin and subcutaneous cellular tissue. That it is an atonic condition is inferred in my own mind from the fact that in every individual case in which I have seen it there seemed to be a scrofulous association. This, however, may have been accidental, as I do not find it referred to by others.

Of the exciting causes of keloid, dermatologists express no opinion: it is traumatic, and it is idiopathic; it appears upon a skin which before has seemed entirely healthy, and it springs up in the cicatricial tissue of a wound. The cicatrices of bad burns from dry heat very frequently so represent this disease that one might be readily mistaken for the other. Keloid certainly constitutes a diathesis; I have seen it develop after a simple puncture which opened a boil, while the observations of others have remarked it appearing in the cicatrices of smallpox, after scarification in cupping, after vaccination, blistering, etc. Processes or roots pass into neighboring parts, thus extending the disease; the excrescences, to the touch are hard, semi-elastic, and rough; the color differs from the surrounding parts—varying as do the cicatrices of burns. According to the observations of Professor Gross the parts itch and are more or less uncomfortable. Any peculiar sensation I have myself, however, never heard complained of, except, indeed, as the location of some wheal would interfere by its stiffness with free motion in a part.

A keloid tumor seems to be an imperfect fibrous development, a species of sarcoma—although it certainly differs from the latter condition in never, as far as I know, tending to degenerate.

TREATMENT.—This has, in every instance, proved so unsatisfactory, that surgeons are agreed in the practice of letting them alone;

even the knife is useless, or worse than useless; if a nodule or wheal be removed, one or perhaps half a dozen will certainly spring up in its place. Where the tumors interfere much with motion, they may be lubricated with glycerin or oil, but otherwise nothing can be effected by treatment—the only satisfaction to be derived by the patient resides in the consciousness that keloid never degenerates into cancer.

CHAPTER XXIX.

THE ANTRUM OF HIGHMORE, AND ITS DISEASES.

Eighteen years spent in a direction of practice which should have afforded every opportunity for observation, and as well a scope of view, which necessarily offers to one who is not an unfrequent visitor at hospitals and clinics—combine to impress me with the truthfulness and propriety of the conclusion, that the diseases of the antrum, outside of such tumors as have been described, are, for the most part, simple in character, easy of diagnosis, and not, as a rule, at all difficult of treatment. Indeed, I have not unfrequently thought that, for the purpose of general study, one would not be entirely without justification in asserting that there were but two sources of trouble to be found in this cavity; the first, and prominent, being lesions secondary to the diseases of the teeth. The second, the troubles common to mucous membranes, wherever situated.

Certain I am, at any rate, that, without fear of successful contradiction, I may assert that the great majority emanate from the first of these directions; while the atonic conditions, represented by the dropsies, the puruloid secretions, the mucous engorgements, and the ulcerations, are nothing different from the ordinary mucoid affections, except as modifications may be made by situation, the last being conclusively proven, I think, by the fact that what is the cure of the one is the cure of the other.

While thus asserting, however, that in these two directions lie the chief sources of trouble, I would not by any means be understood as implying that the subject is unworthy investigation outside of such considerations; on the contrary, I am bound to confess that I find recorded more than one description of diseases of the cavity, which to me, at least, are as anomalous on principle as they are in description, and which I can only explain on the ungenerous supposition that the authors must have drawn somewhat on their descriptive powers, or otherwise that the antrum has some of the strangest anomalies.

Again, as a class coming between these uncommon and the common affections, we have it, not at all indirectly, that there exists sequela of certain of the exanthemata which have a special and peculiar affinity for this cavity; while, in syphilis, I have myself seen the very first event in the secondary train exhibiting itself in a disturbance of this sinus. That this latter, however, is rare, I well know from observation extending over thousands of cases in hospital; indeed, syphilitic troubles of the antrum are so infrequent even in the tertiary stage of that affection, that my observations would lead to the inference that the cavity never takes on the disease unless when, from continuity of structure, it absolutely has forced upon it, as it were, the trouble, either from its relationship with the hard palate in the oral direction, or with the turbinated bones in the nasal; for, while the practitioner will surely hear complaints, yet, if he investigates the cause of trouble, he will find, as I so often have, that mercurial inflammation of periodontal membranes is the source of offense, rather than the specific condition. Clumsily performed surgical operations are also the occasional causes of morbid conditions being set up in the cavity, and which, when existing, would of course be so evident as to force the consideration of them upon the attention—the most common of these being the breaking of the fangs of teeth in attempts to extract these organs.

With these preliminary remarks, we pass, then, at once to a consideration of the premised principal cause of antral trouble—diseased teeth.

In the chapter treating on "Anomalies of Dentition," attention was directed to the close relationship of the fangs of several of the teeth with the floor of the antrum, and to the fact that it was not unfrequent to find these fangs—particularly the palatine of the second molar—penetrating the sinus, thus associating their periosteums, and furnishing a continuity of structure.

In the same chapter attention was also called to such diseases and conditions of the alveolar border as were apt secondarily to affect the antrum; means of diagnosis and treatment being suggested. The reader who may feel sufficient interest in the subject might find it not amiss to review the chapter alluded to, before proceeding to the consideration of the clinical cases presented, and which, I think, will sufficiently illustrate this department of diseases of the antrum.

Case I.—*Indolent Tumor on the Right Cheek.*—A woman had

an indolent tumor on the right cheek about the size of a pigeon's egg, occasioning much disfigurement, but altering the color of the skin very slightly. The patient had often suffered violent toothache on this side, and, though young, had few teeth now remaining, and these all carious; otherwise she was in very good health. The tumor was prominent toward the cheek, palate, and nostril, yielded on pressure, and gave a slight noise as it returned to its position.

These symptoms caused the practitioner to suspect the existence of some fluid, which it was necessary to evacuate and follow with suitable injections. For this purpose, the cheek was drawn aside, and an incision made into the bone above the gum, with a bistoury, enlarging it before and backward, till a sufficient opening was obtained, from which escaped an inodorous mucous fluid. The bone was at no point denuded of its periosteum, the wound was dressed with a pledget of lint saturated with spirits of wine, and the next day the patient was better. On the third day she was feverish, the sinus was swollen and painful, and the discharge acrid and fetid. These symptoms were controlled by proper remedies, and, after twenty-four days, the walls of the sinus were nearly restored to their normal condition.

The canine tooth of this side being very obliquely situated, it was thought proper to extract it, and thereupon followed an escape, through its socket, of fluid contained in the sinus, though the tooth itself seemed perfectly sound. Through this orifice injections were made. The opening made in the external wall healed promptly, without any exfoliation; in six months the tumor entirely disappeared, and the patient was cured. (From Baron Haller's Collection of Medico-Chirurgical Theses.)

The translator of the above case, in commenting upon the treatment, pointedly remarks: "One cannot fail to see the uncertainty, not to say obscurity, of the treatment here adopted. Though all the teeth were carious, and their extraction was plainly indicated, an incision in the external wall of the antrum, or, more correctly, its destruction, was determined upon. The result we see in the symptoms which supervened on the third day, which were, perhaps, hastened by the spirits of wine. We have here a canine tooth quite displaced and involved in the tumor; yet it was long before the idea of its extraction occurred, though the subsequent discharge, through its socket, proved how advisable it would have been at the commencement of the treatment. In this way the time of cure might have been shortened by half."

Case II.—*Distention with Softening of the External Walls of the Sinus.*—In ——, says this same surgeon, I was consulted in the case of a large tumor of the right cheek. The external wall was much distended and softened, and yielded to pressure, upon the removal of which it gave a sound resembling the crushing of an egg-shell. The nose was turned to one side—the nostril was obstructed—yet the patient suffered no pain, and the skin, though distended, preserved its natural color. On examination of the mouth, I found that the crowns of the bicuspidati and molars were destroyed by caries, which induced me to advise the extraction of their persistent fangs; the patient consenting, this was immediately done. The shock occasioned by the extraction of each of the fangs, caused a portion of fluid to escape from the sinus through the natural opening; it was thin, reddish, saline, and inodorous, and, in all, about three spoonfuls. The tumor could now be made to disappear by pressure, but would again return to its full size. Pressure caused no escape of fluid through the nasal, and but slight through the alveolar opening, which was at the bottom of the first molar socket, and large enough to admit the finger.

The internal membrane of the sinus was entire, except at the alveolar opening; through this I made injections of warm water, strengthened with a little alcoholic vulnerary fluid. The next day I injected the sinus repeatedly with a decoction of agrimony* and honey of roses, meanwhile not neglecting external compression. In fifteen days the parts returned to their natural condition, all crepitation of the bone ceased, and the discharge was very slight. I now had recourse to stimulating solutions. On the second day the discharge had ceased, and the alveolar opening was reduced to a mere fissure, and in a month from the extraction of the teeth the patient was fully restored.

Case III.—*Periodontal Abscess affecting the Antrum.*—A patient was brought to me who, for more than three months, had suffered with a tumor like the above, on the right side. The maxillary cavity was distended to a level with the orbital margin; the nose was turned to one side, and the vault of the palate was remarkably prominent. I removed the fangs of the first two molars, the crowns

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* A mild tonic and astringent. An injection of more character would be as follows:

℞.—Glycerin, ℥i;
Tinct. opii camph. ℥ij;
Aqua Cologn. ℥iv. M.

of which had been destroyed by caries, and which I believed to be the immediate cause of the disease. I then enlarged the opening at the bottom of one of the sockets, through which escaped a large quantity of a serous inodorous fluid. Pressure upon the palate and external wall caused its escape through both the alveolar and nasal opening; this compression, together with suitable injections, soon terminated the disease.

The teeth on the left side being in a similar condition, their removal was urged; but to this the patient would not consent. In three months she came to me with a precisely similar swelling of this side, which, having the same cause, I cured in the same manner.

CASE IV.—*Abscess of the Antrum caused by a Tooth.*—The following very interesting and instructive case is from the practice of Dr. J. D. White, and was reported for the *Dental Cosmos* by his son, Horace Meredith White, M.D.:

"Mr. S., aged twenty years, light complexion, peculiar whiteness of the skin, a characteristic of the family, had been complaining for some time of a fetid discharge from the right nostril; of heat, and a sense of tension in the right superior maxilla.

"He applied to his physician, who gave him a wash, with the belief that the parts would speedily return to their normal condition, he supposing the affection to be merely an increased discharge depending on a slight local hyperæmia, the result, perhaps, of the bad state of the weather at the time. The parts, however, did not recover, the discharge became much more fetid, and evidently was principally composed of unhealthy pus, though it was not as copious as it had been previously; the pain was not severe, but the heat of the parts more elevated, and the sense of tension increased. The patient was irritable and pale; the heat of the body was rather above the average temperature. This was the condition of the patient when he came under the care of Dr. W.

"Upon examining the anterior nares nothing could be discovered to account for the discharge; the mucous membrane being a little inflamed, but not sufficient to occasion it. A diseased state of the antrum was suspected, and the mouth was examined to ascertain if a diseased tooth could be the cause. The second molar, upper jaw, right side, was unsound. Part of the crown was decayed away; the bulbous portion of the nerve, and the filaments of the buccal roots, were dead, but that part in the palatine root was living, and occasioned the patient pain. A little arsenical paste was applied to de-

stroy it. No sign of alveolar abscess was present in it or any other tooth. The next day the nerve in the palatine fang was removed without trouble; a careful inspection was now made, and important information was received. Upon examining the right nostril with a speculum, a little pus was seen in the middle meatus. The patient was requested to incline the head toward the left side; he did so, and upon looking at the parts again, a large amount of pus was found. This, together with the facts stated already in this paper, and that there was no other assignable cause of the discharge, were deemed sufficient to establish the diagnosis—abscess of the antrum, caused probably by the unsound second molar tooth.

"Extraction was advised and submitted to. Upon the removal of the tooth no pus escaped. A probe was introduced into the alveolus previously occupied by one of the buccal roots, and readily passed on into the antrum; pus now followed the withdrawal of the instrument.

"The cure was completed on general principles."

Dr. White concludes the description of his case by remarking a coincidence which it will not be at all amiss to repeat here—a coincidence which could only have been alarming enough to the patient. The gentleman had repeatedly visited a horse belonging to his father, which had a profuse discharge from the nose, and which was thought to be glanders. The horse's malady was prior to that of the patient, and, of course, could only have caused him to fear that he had contracted the disease from it.

Dropsy of the Antrum.—This, which is only another name for mucous engorgement, is not unfrequently, as I have had occasion to observe, the result of a reflected chronic periodontal inflammation. In such cases, we have the analogue of similar inflammation in the cavity of the mouth; the membrane becomes puffy and thickened, the mucous secretions become inspissated, the natural opening of the sinus (simply through this thickening of the mucous membranes, the folds of which are the natural outlet of the cavity) become obliterated. All egress being closed, the result is not difficult to surmise: if there should not occur atresia of the occluding membranes, and no correct surgical assistance is afforded, there must, of course, result either the gradual attenuation of the weakest portion of the parietes of the cavity, or the setting up of active and severe inflammation. If, on the contrary, the natural outlet has a partial restoration, it is not at all unlikely that a troublesome—and, if misunderstood—a tedious and unmanageable puruloid discharge will ensue:

this being the result of a continuance of the cause of trouble. Recalling illustrative examples from my own practice, I remember particularly the case of a child who, previously to coming under my care, had been treated nearly two years for the occasional discharge of muco-purulent matter from the left nostril; the child was of bad temperament, being a cross of the bilio-lymphatic. This patient I had the satisfaction of relieving in a single week, the treatment being wholly directed to the dental arch, if I may except a course of salt sheet-baths—continued long after the local cure, and which had been directed in consideration of the relaxed condition of her general system.

The relation of temperament and conditions are to be closely considered in connection with these diseases of the antrum; it is, of course, far from being every one who is troubled with a bad tooth, the fangs of which penetrate the cavity, that has secondary disease as the result. I have just now under treatment a patient suffering from necrosis of the whole roof of the mouth, the result of a syphilitic cachexia, the exciting cause of the local trouble being an incisor tooth anomalously developed. This tooth, the extreme point of which presented just back of the incisive foramen, had been mistaken by a practitioner for the point of a sequestrum, and being worked and cut at, periostitis had developed; and when the dead bone, which is the result, is ready to come away, I am sure I shall find both antra exposed.*

Without such predisposing cause, it is evident that this extensive disease would never have been excited. It is the same, as in every direction of surgical practice—one man receives a wound, a cut perhaps on the face, and it troubles him so little that he scarcely stops for a moment his work to examine the injury; another receives precisely the same kind of a wound, and in a week he is dead from erysipelas.

A purulent condition of the secretions of the antrum may be viewed as one would view a gonorrhœa; indeed, Mr. Bell, the English author, describes the conditions as being similar. "Both diseases," he says, "consisting equally of an altered secretion; in the one, of the pituitary membrane, and in the other of the muscular lining of the urethra, which, in neither instance, possesses any of

* This proved to be the case; the lost process being now replaced by an obturator. For the making of such an instrument, see "*Palatine Defects.*"

the characteristics of abscess, though the matter in both is purulent."

Certainly, if we allow for some differences, as influenced by cause and location, the description of the one would very well answer as the description of the other. In both we have the same perverted secretion, the same molecular change, the same sthenic and asthenic modifications.

As a gonorrhœal discharge is always preceded by certain inflammatory conditions, and as, after the subsidence of the acute attack, the discharge may long continue profuse, or, on the contrary, may decline to a scarcely perceptible minimum; so, in antral purulency, must we have the associated inflammation, and may have the profuse or limited secretion.

In antral diseases, however, as may be readily inferred, very much depends on the nature and associations of the secretion. A profuse discharge, with closure of the orifice of the cavity, must necessarily entail the most untoward consequences; the walls of the cavity will attenuate until (unless surgically relieved) the weakest point will give way, the rupture being most apt to occur, either within the orbit, or the mouth. Not unfrequently, however, this weakest portion seems to be the canine fossa, and the opening has occurred at the tuberosity. My own experience would lead to the inference that the hard palate is, by far, the most common point at which the matter seeks egress. You will see a tumor bulging out from one side of the mesial line, and which advances more or less rapidly, until fluctuation becomes very distinct. A sign diagnostic of this class of tumors is, that its internal boundary is apt to be quite abrupt, and does not pass the line midway to the mesial division. The establishment of a fistule relieves it at once of the sense of distention, and if it has formed in a convenient place, as within the mouth, the patient may feel disposed to congratulate himself on having come to a sufficient cure. Unfortunately, however, in the majority of cases, this satisfaction is of short continuance; for, independent of the fact that the disease at once takes on the chronic form, making the sufferer an object of disgust to those with whom he is brought into immediate contact —the fetor of the discharge, under some circumstances, being really unbearable; yet, also, is the undue retention of the secretion within the cavity such a source of irritation to the parts that, not unfrequently, the most serious lesions result. In some instances, the whole of the bones of the face are destroyed.

The causes influencing retention of these secretions are twofold: First, the external wound is apt to heal, and to continue impervious until an increase of the secretion induces sufficient pressure to cause its absorption, as in any case of abscess. In the second place, the passage is blocked up by flocculi within the cavity.

Puruloid secretion in the antrum may, from the onset, be of so limited a character that—like secretions in certain of the ovarian cysts—years may pass before marked inconvenience results. I am acquainted with a case, that of Mr. C——, late an eminent merchant of this city, in whom, after five years of great mental and physical suffering, a disease of the antrum, supposed to be malignant, was found to be nothing but simple muco-puruloid engorgement depending upon a dead tooth. In this case the trouble had commenced with a feeling of heaviness and oppression in the body of the jaw; the parts had gradually enlarged until finally there was distention of the cheek to the size of a large fist, the eye being thrown entirely out of position from the rising of the roof of the antrum. Much treatment had been given the case without the slightest accruing benefit. No attention, however, had been directed to the dental arch—the teeth, although the patient was sixty years of age, being apparently in the most perfect condition.

The result of this case was the diagnosis, on the part of a surgeon to whom he finally applied, of a dead nerve in one of the bicuspid teeth; the organ, although as healthy-looking as any of its fellows, responded to the stroke of an instrument in the manner as described in the chapter on Alveolar Abscess; this tooth was extracted, and in six months the health of the patient was perfectly restored.

A circumstance connected with the extraction of the tooth in this case offers an example of practice of which it is well not to lose sight. The practitioner who related to me the circumstances of the case informed me that he expected to find associated with the tooth fang a pyogenic membrane, and to have the extraction followed by a gush of pus, in both of which, however, he was disappointed. The fang was clean, and the blood which followed the operation had nothing peculiar about it. Not to be thus balked, he passed a probe up the alveolus of the extracted tooth, which, meeting a resisting yet yielding body, he punctured in the direction of the antrum; the withdrawal was followed by a profuse purulent discharge. This resisting body may be simply flocculi, as alluded to, or it may be the mucous membrane proper to the parts—most likely it would be found the latter, for we are to remember that it is not alveolar or

antral abscess with which, in these cases, we are dealing, but simply what might be termed a mucitis, and, of course, a break in the continuity of the membrane is not necessarily to be looked for. The practitioner, in this case, only approximated to the exact condition; he thought, evidently, that the trouble was tooth abscess discharging itself into the sinus, whereas (while the treatment was perfectly adapted to the requirements) the case was one of simple mucous or muco-puruloid engorgement, the result of reflected irritation.

The diagnosis of mucoid and puruloid engorgement of the antrum is, as a rule, not difficult to make out. At first there is inflammation, and this, as suggested, is found most likely to have origin about the teeth. As the trouble advances, the patient begins to complain of a sense of heaviness about the body of the cheek. If the secretion is active, there will be much pain, sometimes sharp in character, but more frequently heavy and unbearably dull. In all chronic periodontal inflammation, we have this same dull pain, but then it differs from the pain of engorgement in being confined to the alveolar arch; in this latter trouble the greatest pain is found, I think, associated with the floor of the orbit, which, as will be remembered, makes the roof of the antrum. At length, as the secretions accumulate, the parietes of the cavity begin to attenuate and expand. The tumor now forming may be distinguished from others—first, by the history of the case; second, by dryness of the nares of the affected side, the result of the closure of the orifice of the antrum; third, by the gradual and regular enlargement; fourth, by the non-association of the integuments of the cheek; and, fifth, by the fluctuation which it will finally yield.

To treat successfully such a trouble, we have only to search out the source of offense, and, where it is possible, remove it. If this should prove to be a tooth, we may, if necessary, secondarily treat the antrum through the alveolus. Where the trouble is thus of strictly local origin, we shall find that we need to do very little more than employ daily some stimulating injection: diluted tincture of iodine is a favorite with me. Where the acrid character of the retained secretion has provoked degenerating ulcers, I have obtained the very happiest effects from weak injections of chloride of zinc.

If, on the contrary, such bad conditions of the antrum be associated with constitutional causes, I need not suggest that such causes must have our attention. In these latter cases, however, where the cure promises to be tardy, we may give to a patient complete relief,

locally, by making an opening into the antrum, and keeping it patulous by means of a cotton tent; this, combined with the daily employment of such injections as may seem indicated, will be found to yield most decided benefit.

Concerning abscess proper of the antrum, I think it may be set down as the rarest of rare diseases. Bell and Bordenhave each mentions a case. Abscesses, described so frequently as occurring in this cavity, will, I think, commonly be found to have their origin in the alveolar border, and if treated as any ordinary case of alveolar abscess, will generally at once succumb. (See chapters on *Alveolar Abscess*, and *Anomalies of Dentition*.)

"While," says Dr. Richardson, "we cannot trace out the nature of that condition of the blood which gives rise to purulent formations, we are informed by observation of the external conditions which foster it. We learn that the pus-producing disposition is an indication of deterioration of blood. We see that when the system is enfeebled, whether by diathesis hereditarily supplied, as by the strumous diathesis—whether by epidemic influences, or whether by deprivation of nitrogenous food, or the inhalation of bad air—that under these circumstances the tendency to purulent formations in local structures is marked, and that, in extreme instances of the kind named, the act of suppuration may take its absolute origin from blood thus depressed.

"Hence we have reduced almost to a principle in medicine, the saying, that suppurative tendency is a sign of an impaired or vitiated nutrition. Hence, also, we reason in speculative argument, that pus is blood transformed into a lower form of organization, and we adduce, in evidence of this view, that the purulent fluid is incapable of organic construction, and that animals in which the respiration, the circulation, and the animal temperature are more than ordinarily active, the formation of pus, even in an open wound, is an occurrence almost unknown."

These remarks, from the lectures of Dr. Richardson, cannot fail in being suggestive; they have indeed much meaning; but I must be permitted to suggest, to the student reader, at least, that their signification is limited. Puruloid conditions are, without doubt, and as the rule, perhaps, indications of asthenia; but it would be very wrong indeed to jump from such data to the conclusion that every puruloid disease requires treatment from the constitutional stand-point, and particularly will this hold good as the diseases of the antrum are concerned.

All diseases should be treated on principle; M. Ricord, as will be recalled by many of my readers, has a favorite prescription for gonorrhœal purulency, which runs as follows:

R.—Pulv. cubebæ, ℥vi.
Ferri carb. ℥iij. M.

Now, anybody can understand that such a combination would most naturally act well on a debilitated system; and I should suppose it would be a most happy prescription for half the *roués* of Paris. Where applicable, it would answer as well for the puruloid antrum. I remember, during the past summer, treating a gentleman for a gonorrhœal difficulty, which he had contracted almost immediately after my getting him over an attack of syphilis. I treated this patient locally over six weeks, the discharge constantly increasing in quantity. At the expiration of this period I put him upon copaiba, tinct. of iron and quinia, and sent him to the seaside for a few weeks. The discharge at once began to diminish, and after the eighth day disappeared entirely. A success of this kind would not, however, lead to the inference that every man afflicted with a purulent discharge should be treated with tonic stimulants. On the contrary, I have had the opportunity of prescribing very frequently for this condition—gonorrhœa. Yet it is seldom that indications have seemed to me to call for anything more than a strictly local treatment; at any rate, I have generally succeeded, happily and quickly, in getting the patients over their trouble.

On a previous page it was suggested that puruloid conditions of the antrum had origin chiefly from two directions: first, from diseased teeth; second, from constitutional disturbance, manifesting itself in the mucous tissue. It was also desired to convey the inference that where the fault was markedly in the first of these directions, the practitioner would err on the right side, if, in his first consideration of the case, he should incline to look upon the tooth only in the light of an exciting cause, searching farther for what might be the predisposing condition. It is, however, to be inferred that lesions of the cavity may exist, and yet constitutional conditions have really nothing to do with them, and in the treatment need not at all to be taken into the account.

As a line in practice, however, running between these two conditions, I may allude to the fact of having met cases where inference of constitutional association seemed most marked, yet, without a resort to other than local treatment, I have soon cured my patient.

These are the kind of cases in which the medical man must feel his way; if he be an observer, it is not likely that more than a week will pass without yielding him just conclusions.

Coming now to the investigation of cases where the cause is to be found alone in some cachexia, we have only to refer back to the general features of disease as manifested on mucous membranes.

The most common, and indeed not very unfrequent cause of engorgement of the antrum—particularly mucous engorgement—is simple catarrh of the Schneiderian membranes. The patient takes a cold, the excitement expends itself about the nares; by simple continuity of structure the lining membrane of the sinus becomes vascularly excited; perhaps the duplication at the orifice, because of greater nearness to the central ring of inflammation, becomes congested to such extent as to close the opening; thus we have the elements for engorgement, and the mucus thus confined will, if not vented, sooner or later act as such a source of irritation that it will become to the membrane of the cavity almost precisely what the virus of gonorrhœa becomes to the same character of membrane lining the urethra. Trouble from this cause is, however, generally so slight and so quickly over that it is seldom prominently marked, either to patient or practitioner.

The symptoms designating this condition are, first, simple vascular excitement of the membrane lining the nares, accompanied with increase of mucus.

As the grade of inflammatory action advances to complete congestion, the excess of mucus associated with the immediately preceding stage is succeeded by a most uncomfortable deficiency in the secretion.

This dryness is associated with all nasal inflammations of advanced grade, but when the trouble is to implicate the antrum, it is even specially marked. A single moment's consideration of the parts makes this very plain: the nares are the natural outlets for the antral secretions; in ordinary Schneiderian catarrh the extensive secretory surfaces of the antra are comparatively unaffected: of course they serve to lubricate, to a greater or less extent, the passages. When, however, the grade of inflammation is of sufficient extent to congest the duplicatures of membrane which form the nasal outlets, then, because of the retention of the mucus, the extreme dryness is induced. This excessive dryness may be said, therefore, to offer the first diagnostic sign of antral engorgement from simple

catarrh From this point the disease advances or declines. If it declines, the trouble may have proved of such trifling inconvenience as scarcely to have attracted the attention of practitioner or patient. If, on the contrary, it advances, the patient will soon be made conscious of the advancing engorgement by a sense of growing heaviness in the cheek, attended by pain of a dull, sluggish character. The progress of the disease from this condition is precisely the same as that described as accruing from dental troubles.

Treatment.—This is to be conducted on general principles. Where the disease is seen in its incipient stage, it will, perhaps, be found unnecessary to do more than administer a saline cathartic; or, what I have found a most satisfactory treatment, is to administer to the patient at bedtime one-sixth or one-quarter of a grain of sulphate of morphia dissolved in an ounce of the liq. ammoniæ acetatis. This latter treatment will seldom be found to fail in breaking up these limited congestions.

Where, however, the disease has advanced to engorgement, and the antrum is found to be enlarging, it may be necessary, in order to insure against even more serious lesions, that treatment shall be directed immediately to the cavity. To accomplish this, extract the second molar tooth, and penetrate the cavity through the alveolus of the palatine fang; in this way such medication as may seem indicated may be readily employed; indeed, for a cure it may be only necessary to keep patulous the wound, leaving the rest to nature, or, if there should seem a lack of vital force, I do not think a much happier stimulant can be employed than the tinct. of iodine.

Furuncular Epidemics.—It will be found, I think, the conclusion of every one who has observed in the direction, that during the existence of furuncular epidemics, mucous and purulent engorgements of the antrum are most common. This is not strange, if we consider the epidemic condition in the light of an exciting cause alone, for in no single instance where my attention has been called in such direction, have I been unable to discover a predisposing cause in a dead or diseased tooth. The same condition of things exists in regions where the intermittents are endemic. All the odontalgias and cephalalgias of such a country are apt to be quotidian, tertian, or quartan. Furuncle is a condition associated, it would seem, with some derangement of the digestive or cutaneous functions. When epidemic, it would be in proof that a condition existed adverse to the performance of certain physiological functions. With the existence of a predisposing cause of disease about the antrum, it is not

at all strange that the addition thereto of an exciting cause should at once increase the effect of the irritant even to the production of active disease,—and such, in truth, is the case: the patient escapes the purulency of boils, but he has purulency of the antrum.

Treatment.—This I need scarcely refer to: it consists, imprimis, in removing the source of local irritation; secondly, in correcting the constitutional disturbances.

Scorbutus.—This diathesis, as may be inferred, predisposes to antral purulency and ulceration. To understand the local condition thus induced, it would be only necessary to examine the gums in an individual so afflicted; the condition of the antrum is akin to the condition of the mouth. The treatment, to be successful, must be from the constitutional stand-point. If injection of the cavity seems indicated, it must be gotten at as before directed, or a canula can be passed into it through the natural opening in the middle meatus; the latter is, however, difficult, and therefore liable to objection.

The Exanthemata are said to associate, not unfrequently, their sequelæ with this cavity. Treatment thus demanded could need no special consideration,—it would be a treatment founded on general principles.

The Mercurial Diathesis.—I have before referred to the troubles of the cavity thus provoked. Mercury holds a double pathological relation to the antrum; it predisposes from its constitutional relations, and actively and locally excites, through the periosteal inflammation it excites in the alveoli of the teeth. (The same I should also have remarked of scurvy.)

Treatment.—The indications here are twofold. Resolve, if possible, the inflammation about the teeth (see chapter on *Alveolar Abscess*), and eliminate the mercury from the system. The chlorate of potash and the common muriate of soda are valuable medicines in this direction; the latter I frequently employ, and with marked success.

Syphilis.—This is a disease which it might be inferred would, of course, have an affinity for such mucus-lined surfaces as the antrum. Now mine may be a singular experience, but in contradiction of many authors who have written on the subject, I must say that, with the wide scope afforded by such a hospital as Blockley (where, for over a year, I gave the study of the venereal disease the closest attention), I was unable to find a single case of diseased antra which could with justice be attributed to the cachexia. As I remarked on

a previous page, I have met cases where the origin has been traced for me in such a direction; and I will not deny that, in some cases, this origin may be justly so traced; but, in every case that I have seen, the mercury administered for the cure of the syphilis has seemed to me as having much more to do with the condition than any dyscrasis induced by the virus. (See this subject continued in chapters on *Ozæna* and *Tumors*.)

CHAPTER XXX.

NEURALGIA.

The term neuralgia is from the Greek roots νεῦρον, a "nerve," and ἄλγος, "pain." It signifies a condition, or an effect, and not a cause; or if this definition is not absolutely a correct one, the exceptions to the rule it would form are, I am convinced, exceedingly rare. For such reasons it is, as commonly employed, a very ill and deceptive term, expressing a condition, about as the term suppuration would convey a definite idea of the phenomena of inflammation.

Neuralgia, as the word has been made to have definite application, refers to paroxysmal pains, localized or metastatic, presenting no manifestation of any lesion at the seat of pain outside of the single phenomenon.

The pains of neuralgia are mostly, although not exclusively, acute in character, are confined to the tract, or to the periphery of a certain nerve, remit, or more commonly fully intermit, are alone accompanied with tenderness of the part involved when an accidental associate lesion may exist, or when an irritation is so severe, or has been so long continued, as to have reacted on the neighboring vascular system.

When, then, a practitioner has his attention directed to a seat of pain without apparent lesion, the matter of first importance is an appreciation of its cause. To say that such a one has neuralgia, and to treat him with nervines, is to say just nothing, and to do nothing, except indeed by accident. A first duty is to search for a cause, and if discoverable, remove it, if that be possible. Now these causes of neuralgia are, as I shall further on show, sometimes very evident, and very easy of removal; and it will be seen by the illustrations I shall offer, that one, from lack of observation, utterly fails in giving a relief very easily, and naturally, afforded by another.

Rheumatism and neuralgia are frequently confounded; but how do the conditions disagree? Rheumatism is always accompanied

with vascular perversion, the pain is not distinctly localized, but is diffused over a part involved; it is a soreness, as a general thing, rather than a sharp, acute, concentrated pain. Movement aggravates this soreness, changes in temperature affect it; it is not paroxysmal, although it may be, and generally is, remitting; in short, it has a history, and this history is not difficult to read.

Gout is another constitutional condition occasionally mistaken for neuralgia; but such a mistake should not occur, for here, too, is a history. Gout occurs in the high, indolent liver; it is decidedly inflammatory in its local manifestations. It attacks in preference the small joints; it is accompanied by œdema, by congestion, and by enlargement of the veins; if it is metastatic, the seat of transfer presents like vascular phenomena with the original inflammation.

But is there not a condition, a disease, which is, or might be, termed neuralgia; as, for example, gout is a disease with an individuality, or rheumatism is a disease. If, without being influenced by other than my own observations, I were to answer this question, I should incline to say there is not; and my reasons for the denial would lie in the fact that I have in one way or another become conversant with so many cases which have stubbornly resisted a long course of treatment founded on an abstract neuralgic theory, but which have rapidly and readily yielded on the discovery and removal of some true lesion of which the pain was simply a sympathetic connection,—as, for instance, otalgia, hemicrania, or even sciatica, from an exposed tooth pulp, from a splinter of foreign substance, or from the pressure of an exostosis. It is certainly true that there is a class of persons which might be termed neuralgic; these do not belong strictly to what is called the nervous temperament, but are the anæmic and prostrated. A plethoric temperament disposes to inflammation, but plethora is not inflammation, it is only a predisposition; the nervous temperament is only a predisposition. One could not deny that cases, called neuralgia, and treated without ideas of a definite lesion, do very frequently get well; but has not the indication been accidentally met, just as with the Dewee's carminative we treat the restless child and cure it without definite idea of the ailment, having in a single medicine the requirement of various conditions? I think this is so.

If neuralgia, then, is simply a phenomenon, simply the expression of an immediate or distant lesion, the preliminary treatment lies in a search after a cause. But is this cause always evident? It truly is not, at least to our present acquirements; but still it exists, and

failing to discover it, we are compelled to desert principles and experimentally treat with the hope of an accidental success.

Are there predisposing causes of pain radiation? Undoubtedly there are, and these may, and always should, receive a proper degree of attention, as, in guarding against them, it might be that the proper lesion would not, in itself, be sufficient to inaugurate or maintain the neuralgia. Thus, of the exciting causes, a damp, cold atmosphere is probably one of the most potent. Fatigue, overexcitement, excess in drinking, poor diet, the too free use of coffee or tea, loss of sleep, costiveness, diarrhœa,—in short, any and everything which interferes with the easy and proper performance of functional life.

In miasmatic neighborhoods, neuralgia frequently assumes the periodic type, evidently influenced by the malaria. And it is without doubt true, that the exhibition of quinine will and does, not unfrequently, cure such cases; whether this is because the medicine controls the full and complete cause of the trouble, or only removes an exciting cause, which, in its absence, gives to nature the mastery, I scarcely know, it being, without doubt, certain that it is not by any means always the case, that in the destruction of the periodicity the pain is removed.

Syphilis is another of the exciting causes of neuralgia. I have known a patient have great pain from diseased teeth, which could be held completely under control, although not cured, by iodide of potassium,—proved to be from the teeth, as with the subsequent removal of these organs the trouble disappeared.

To epitomize the subject, we might say that in a state of health the nervous system represents the poised balance: it is neither excited nor depressed; it works in entire harmony with its requirements. Apply now a source of irritation, and this harmony, or balance, is destroyed. According as the amount and extent of irritation, so is the amount and extent of derangement. Life, says Bichat, rests upon the tripod of innervation, respiration, circulation. Whatever affects one of these legs affects the whole body. To appreciate the phenomena of neuralgia is, then, to appreciate the phenomena of irritation; is to search over the economy until whatever lesion exists is exposed and comprehended.

If a first view is directed to the nervous system itself, we look for a lesion in the part which, by the expression of pain, seems most markedly implicated. The most decided cases of neuralgia are, without doubt, odontalgic,—a tooth decays until the cavity containing the

delicate nerve is exposed; the neuralgia has the simple, single signification of a direct irritation; exostosis of a tooth root presses on nerves ramifying in the alveolo-dental periosteum: the signification is a similar one.

Let us refer to a neuralgia occurring in the stump of amputation. Is the cause not most frequently found in the squeezing and pinching of a nerve caught in the cicatrix? Is it not the same history where tumors grow about and press upon some nerve periphery? But I had meant rather just here to call attention to derangement in nerve substance itself, without associated or influencing lesion, if we might be able to find such derangements. Might I instance neuromatous expansion as found in stumps—and which are, evidently enough, sources of pain? Are there idiopathic inflammations of nerve substance? or do nerves in themselves degenerate and ulcerate? We may look at the subject from a still wider stand-point. There is no earthly doubt that a pure nervous irritation of the system at large may exist. There is certainly an individuality existing in this system. It has a mode of action of its own, and this action, as remarked by Dr. Wood, is susceptible of exaltation, depression, or deprivation in itself, and from the influences of its own peculiar agents. But can or do these vicissitudes express themselves ever, or even occasionally, in sharp neuralgic pains? Connected with the digestive function we have often nausea and vomiting; with the secretory, disorder of the liver and kidneys; with the respiratory, hurried and otherwise irregular breathing; with the circulatory, a frequent and agitated, though seldom full or energetic, pulse. "As the offices of the brain," says Wood, "are various, so also must be the signs of its excessive excitation. Irritation in the brain obeys the general laws of that morbid affection. If moderate, it exalts the healthy functions without otherwise altering them; if stronger, it more or less degenerates the functions; in great excess, it entirely changes or abolishes them. Thus, sensation and perception may be rendered simply more acute; or may be deranged, producing vertigo, pain, and every variety of disorder, in vision, hearing, touch, etc., from buzzing in the ears, unnatural coloring of objects, a sense of tingling, formication, etc., to complete hallucination. The intellectual faculties and the emotions may be excited into increased vigor, or may be completely perverted, as in delirium and insanity. The general overseeing faculty of the brain may be simply stimulated to increased vigilance, to a more ready and rapid response to all the intimations of its dependent functions; or it may be thrown

into excessive disorder, evinced by restlessness, jactitation, obstinate sleeplessness, etc. The motor faculty may merely impart increased activity and energy to the muscles under the influence of the will; or it may throw off more or less completely subordination to that principle, and give rise to every variety of spasm and convulsion. Finally, all the functions above referred to may be overwhelmed by an excess of irritation, and more or less completely lost in stupor and coma. This is nerve irritation, from causes or influences which reside in, or in association with the system, and to be considered alone in connection with the system."

Reactions of vascular perversion on the nervous system are to be considered. Coup de soleil and apoplexy may be esteemed the opposite conditions in such reactions How frequently have all the phenomena of partial compression—headache, giddiness, buzzing in the ears, disordered vision, tingling, formication, numbness, drowsiness, mental confusion, spasms, convulsions, etc.—been quickly resolved and removed by the accidental rupture of a nasal vein having communication with a meningeal sinus! And how happily, when similar conditions have come on from long-continued chlorosis, has a course of iron relieved them! Every portion of the encephalic mass, every portion of its continuation in the spinal canal, every nerve periphery, requires a certain amount of, and a certain character of, blood, to keep it in proper poise and nutrition. Too much blood, and too nutritious, and we have derangement from overstimulation; too little, and too poor, we have it from lack of pressure, lack of nutrition, and from, in many cases, effusions.

Derangements in respiration act as predisposing causes to neuralgia. A patient who labors under an inability to aerate his blood, whatever may be the cause, fails to relieve that fluid of certain poisonous qualities, which, of a necessity, sooner or later must disturb the nervous economy.

Anything and everything, in short, it may be said, which acts as a depressant in the vital economy, whether by overstimulation or by under-nutrition, is to be thought of, and considered, in neural derangements; overstudy, sensual excess, indigestion, hepatic and nephritic diseases, repression of the cutaneous circulation, the depressing passions, as fear, grief, melancholy; the employment of sedative poisons, as opium, tobacco, chloroform; living in an atmosphere impregnated with irrespirable gases,—any and all of these may assist some otherwise incapable lesion in determining an attack of neuralgia.

The most extreme case of nervous mania that has ever come under my own observation, accompanied with general hyperæsthesia and local neuralgia, was in the person of a carter, addicted to habitual smoking. For three days this man was uncontrollable by any but physical restraint; at the end of which period, having secured a short interval of sleep and quiet, I placed between his lips a pipe of the strongest tobacco. I finally cured the patient, making the section of a nerve, and treating him with tobacco and sedatives, just as one treats delirium tremens with whisky and sedatives. In this case I am entirely satisfied that the local neuralgia was goaded to its intensity by the perverted condition of the general nervous system. Several cases of similar import I can recall, associated with the improper use of opium, and with the abuse of the sexual instincts.

In a letter to the *London Times*, republished in the *Medical Times and Gazette*, Sir Benj. Brodie expresses his general disapprobation of the habitual use of tobacco, and makes the following observations on its deleterious effects:

"The effects of this habit are indeed various, the difference depending on difference of constitution and difference in the mode of life otherwise. But, from the best observations which I have been able to make on the subject, I am led to believe that there are very few who do not suffer harm from it, to a greater or less extent. The earliest symptoms are manifested in the derangement of the nervous system. A large proportion of habitual smokers are rendered lazy and listless, indisposed to bodily, and incapable of much mental, exertion. Others suffer from depression of the spirits, amounting to hypochondriasis, which smoking relieves for a time, though it aggravates the evil afterward. Occasionally there is a general nervous excitability, which, though very much less in degree, partakes of the nature of the *delirium tremens* of drunkards. I have known many individuals to suffer from severe nervous pains, sometimes in one, sometimes in another part of the body. Almost the worst case of neuralgia that ever came under my observation, was that of a gentleman who consulted the late Dr. Bright and myself. The pains were universal, and never absent; but during the night they were especially intense, so as almost wholly to prevent sleep. Neither the patient himself nor his medical attendant had any doubts that the disease was to be attributed to his former habit of smoking, on the discontinuance of which he slowly and gradually recovered. An eminent surgeon, who has a great experience in ophthalmic diseases, believes that, in some instances, he has been able to trace blindness from amaurosis

to excess in tobacco smoking; the connection of the two being pretty well established in one case by the fact that, on the practice being left off, the sight of the patient was gradually restored. It would be easy for me to refer to other symptoms indicating deficient power of the nervous system to which smokers are liable; but it is unnecessary for me to do so; and, indeed, there are some which I would rather leave them to imagine for themselves than undertake the description of them myself in writing.

"But the ill effects of tobacco are not confined to the nervous system. In many instances there is a loss of the healthy appetite for food, the imperfect state of the digestion being soon rendered manifest by the loss of flesh and the sallow countenance. It is difficult to say what other diseases may not follow the imperfect assimilation of food continued during a long period of time. So many causes are in operation in the human body which may tend in a greater or less degree to the production of organic changes in it, that it is only in some instances we can venture to pronounce as to the precise manner in which a disease that proves mortal has originated. From cases, however, which have fallen under my own observation, and from a consideration of all the circumstances, I cannot entertain a doubt that, if we could obtain accurate statistics on the subject, we should find that the value of life in inveterate smokers is considerably below the average. Nor is this opinion in any degree contradicted by the fact that there are individuals who in spite of the inhalation of tobacco smoke live to be old, and without any material derangement of the health; analogous exceptions to the general rule being met with in the case of those who have indulged too freely in the use of spirituous and fermented liquors."

With such general considerations of the matter, I may pass to illustrations in the recital of individual cases. By the study of these cases the student will, I trust, secure proper ideas of practice.

Case I.—Mrs. B., the wife of an undertaker, suffered for a long period from periodic attacks of pain about the face and head. This person, exceedingly quiet and retiring, spent most of her life in sunless rooms, surrounded by the melancholy paraphernalia pertaining to the business of her husband. She was anæmic, and of poor general health and spirits. Although this patient had certain bad teeth, yet the pain had never seemed associated with them; indeed, so insensible were these organs to ordinary agents of irritation, that a diagnosis was founded alone on her general condition and surroundings, and remedies applied entirely in such direction. Tonics

were administered, window-shutters were unbowed, exercise and amusement, conjoined with generous living, were advised; even with this entire change the patient failed to improve, but, on the contrary, grew worse. The diagnosis thus discovered to be at fault, the teeth were extracted; still the condition persisted, and the pain increased. She was now treated for over a year, the pharmacopœia being exhausted in her case. Called in consultation, I determined to make a most careful exploration of her whole system. At this period the pain had assumed and continued the impression of an iron clamp over the head, terminating beneath, and which clamp seemed daily contracting itself. The terror and pain of this impression had become so great as to convert the patient almost into a lunatic. I found, by inquiry, that her internal organs had been most carefully examined, and inferred not to be in fault. My own investigations, therefore, were commenced externally. First, was there any remaining tooth or teeth implicated? I examined for caries, for pulpitis, for nodules, for necrosis, for supernumerary teeth, for exposed cementum; but fully assured myself these organs were in no wise involved. I examined the spinal cord, and through its expressions, the encephalic mass; organically, the trouble was not reflex from these points. I examined every articulation, the line of every artery, vein, and nerve, so far as I might follow them. I passed in review every observation and fact which might enlighten me, but without success, so far as any discovery of an exciting cause was concerned. Finally, I returned to the oral cavity. The teeth which had been extracted the year before were the molars and premolars of the left superior jaw. Might there not possibly have been just the smallest particle of one of these teeth left in its socket? I was making pressure in the canine fossa, when the patient made slight complaint; it was the only point which yielded difference in sensation. Now, what was this sensation, and what did it mean? It was not pain of which the patient complained, not discomfort; it was simply difference of sensation. But it was an only point which had yielded expression; it was therefore differentially just to infer that here existed something,—the lesion, perhaps, of which we were in search. Acting on this only hint, I obtained the consent of the physicians in attendance to make an exploratory trephine of the antrum, and, on performing the operation, discovered lying within the cavity that branches of the intraorbital nerve running across it had enlarged to the size of ordinary knitting-needles. These enlarged nerves, of which there were two, I cut away. The patient was immediately

relieved, and, although a year has passed, she has had no recurrence of her neuralgia.

Case II.—This day, October 16, 1868, have treated and dismissed a patient, a young lady, who shortened a summer and fall campaign to come to Philadelphia for advice concerning neuralgia faciei, and of the ear and scalp. She describes her agony as being sometimes so great that only from chloroform could she get even a temporary relief; has been taking tonics and opiates throughout the summer; has had no pain in any of her teeth, although on the upper jaw is a pulpless molar. Examining her mouth, my attention was attracted to a peculiar overriding of the second bicuspid tooth of the lower jaw by the first molar; the employment of a delicate curved probe revealed caries of the first of these teeth, exposing the pulp; the tooth was extracted, the distant and apparently dissociated neuralgia instantly disappeared.

A tendency to nervous irritability which exists in this patient may very well be rearoused by the presence of the upper dead molar; if this should prove the case, she is advised to have it extracted.

Case III.—*Neuralgia of Neck and Arm from Carious Molar.*—Dr. Hyde Salter, well known in connection with clinical practice, had suffered much from attacks of inflammation in the left lower anterior molar, which was extensively excavated by caries. At the age of seventeen these acute symptoms had ceased for two or three years, leaving nothing but a grumbling uneasiness in it. At this time neuralgic pains began to extend from the tooth down into the neck and left side, and thence over the collar-bone down the left arm—these pains enduring several days and then remitting. There was no actual pain in the tooth itself, nor any tenderness in it, nor in the adjacent gum, nor any appearance of inflammation. The situation of the pain in the neck and clavicular and supramaxillary regions was exactly that of the descending cutaneous branches of the cervical plexus, and the part of the arm where the aching was the most intense and intolerable was at the insertion of the deltoid. These symptoms disappeared with the extraction of the offending tooth, and have never since returned.

Case IV.—*Intense Neuralgia of the Eyeball and Face; Alteration of the Color of the Iris; Carious Teeth.*—Mrs. C., aged thirty, had suffered for ten years from severe neuralgia, affecting the left eyeball and left side of the head and face, the iris of the affected eye having changed from a deep and bright hazel to a dull gray. The left lower dens sapientiæ and the first upper bicuspid being found badly

carious, these were extracted, and the operation was attended by a terrible paroxysm of neuralgia; but after this had subsided the patient experienced relief for about three months, when, the old pain returning, the second upper bicuspid was found to be carious and intensely tender, and upon its removal a considerable exostosis was found on the root. The pain vanished with the tooth. (*Guy's Hospital Reports.*)

Case V.—*Neuralgia of Lower Jaw: Necrosis.*—M. C., a laborer, applied for treatment, complaining of unbearable pain situated about the roots of the inferior central incisor teeth. The most careful examination revealed no explanation, and the patient was dismissed for the day with an opiate prescription. A second, and many succeeding examinations, failed to yield a diagnosis, opiates being continued during the period. At the end of some three weeks an inflammation supervened, resisted all treatment, and finally terminated in a necrosis, which cast off the two teeth with their alveoli; the exfoliation completed, the neuralgia disappeared.

Case VI.—Dr. Benjamin Rush relates a case of neuralgia in the nates, which, resisting other means of treatment, finally yielded to the extraction of a tooth.

Case VII.—*Megrim.*—A protégé of the Princess of Condé was bled in the arm and foot twenty times for megrim of five years' standing. It at last being thought advisable to open the jugular vein, the princess applied to M. Petot to perform the operation. But this surgeon, not seeing the necessity for so frequent depletion, begged to examine the mouth, and found in the lower jaw, in which the patient had for a long time pain and numbness, eighteen, instead of sixteen, teeth, resulting in a very crowded denture. By extracting the second molar on either side he gave complete and permanent relief in twenty-four hours.

Case VIII.—*Neuralgia Faciei and Odontalgia from Menstrual Irregularities.*—A lady of rank (Rayer), long suffering from amenorrhœa, was subject to frequent epistaxis, pain in the side, and swelling of the abdomen and feet. These symptoms were overcome, and for a year she enjoyed good health; but last summer, in consequence of mental distress, a severe neuralgia came on, which was cured for a time, but soon returned with the following curious symptoms: every evening the pains recurred, preceded by the discharge from between the upper canine and bicuspids of the left side of a matter which was at first thick, viscid, and bloody, but afterward clear, and so profuse as to fill a small vessel. The pains continued the

whole night. No remedies gave any relief but opiates, which suppressed both the pain and discharge and gave sleep.

Case IX.—A nun (Wepser), aged forty, was seized, at one of her menstrual periods, with pain in the head, eyes, and teeth. A tooth on the left side was extracted, but without relief; the pain passed to the right side, and for five weeks, with occasional intervals of from half a day to two days, caused much suffering, first on one side of the head, then on the other, the principal seat of the pain being a space two or three fingers broad on the side of the head. When the attacks were violent they were preceded by a strongly-marked chill, the throbbing of the temporal artery was very perceptible, the eye injected, and when the paroxysms were at their height flushings were experienced. In the treatment of this case, as the teeth were discovered to be not at all in fault, the surgeon opened an issue in each arm and a third on the neck, all three of which were made to discharge freely. Attention was also paid to the nervous system, with a view to give it tone and strength. Not much regard was paid to the amenorrhœa, because at such age the menses are usually very scant.

In both the above cases the practitioners failed of a successful treatment, and evidently for the reason that, in both cases, treatment was misdirected. A reflected or radiated irritability of the uterus was without doubt the lesion—an ulcer or other local lesion being the offense.

Affections of the Nervous System dependent on Diseases of the Permanent Teeth.—Mr. Salter contributes to *Guy's Hospital Reports* a most interesting paper under the foregoing title, which contains much information of direct and practical value, and with which illustration, and some suggestive features in treatment, the chapter may be concluded. "Disorders of this kind," says Mr. Salter, "are divided into those which are reflex, secondary, and remote; and those which are direct, immediate, and from contiguity. In the former category would rank epilepsy, neuralgia, paralysis; in the latter local pain, facial palsy, some forms of amaurosis, etc. In other instances, such as those in which exalted sensibility of the tegumentary nerves of the face, or erratic pains through the maxillary nerves are associated with toothache, it might be difficult to say whether the phenomena are mostly reflex or direct; they probably comprise both conditions. . . The posterior lower molars are but little removed from the tonsils and Eustachian tube, from the parotid region, and from the external auditory passage. The fangs

of the upper back teeth are close to the orbit and its all-important contents; and more posteriorly they approach the spheno-maxillary fossa and fissure. Thus it is easy to account for the nervous complications which are directly entailed by the spread of inflammation from the periosteum of diseased teeth.

"By far the commonest reflex nervous disturbances to which dental irritation gives rise are neuralgic pains of the head; and this is especially the case where the upper teeth are implicated. In the supra and infraorbital nerves, the globe of the eye, the temples, and particularly a spot near the vertex, a little on one side (the side of the affected tooth), in all these regions 'dental neuralgia' is really very common; and I have observed, not unfrequently, that, where the pain has continued long, the integument has become hot, and tender, and red. . . .

"The several branches of the trigeminus appear to be the most susceptible of reflex affection, caused by the dental irritation of one of them; but next to the different elements of the fifth nerve, the branches of the cervical and brachial plexuses are most commonly involved. Thus pains in the neck, shoulder, acromion process, insertion of the deltoid, or bend of the elbow, are by no means uncommon, and with them occasionally a loss of motor power, a weary sense of fatigue in the flexor muscles, and an inability to grasp firmly with the hand. It would really seem that there is occasionally, and in some individuals, a special and exceptional communication between the fifth nerve and those of the arm. Dr. Anstie has seen two instances in which wounds of branches of the ulnar nerve have caused reflex neuralgia of the fifth nerve. And he remarks upon this circumstance: 'That the mental perception of the patient should, in each of these cases, refer the pain, not to any point in the course of the injured nerve, but to the branches of the trigeminal, affords, in my opinion, a strong suggestion that that portion of the central nervous system with which the trigeminus is directly connected, presents some congenital or acquired peculiarity of organization.' This idea is fully borne out by what one occasionally, but only occasionally and exceptionally, sees in the occurrence of brachial neuralgia and paralysis caused by dental irritation of the branches of the fifth nerve.

"Reflex nervous irritation, dependent upon dental disease, is most uncertain and capricious in its manifestations. One person will suffer much from a comparatively slight cause, while in others the same condition more severely developed will produce no such

result. There is, unquestionably, in some persons a neuralgic diathesis; and it is not improbable also that, in some individuals, there may be a congenital or induced peculiarity in the centric, or, perhaps, collateral relations of certain nerves, by which the exalted polarity of one may be passed on, and so reflected upon another with abnormal facility. In persons obnoxious to these forms of neuralgia from dental irritation, nothing is so liable to produce an attack as exhaustion or depressed nutrition; and patients will often tell you that the attacks only come on when they are very tired, or have gone long without food.

"*Pain* is only one of the phenomena of reflex dental nerve irritation. It may induce *muscular spasm, muscular paralysis, paralysis of some of the nerves of special sense, perverted nutrition.*

"As regards the teeth themselves which excite this exalted nervous irritability, nearly all their diseases appear capable of causing this condition. Thus:

"Caries, with or without exposure of the pulp; exostosis; hypertrophy of the crusta petrosa; nodular developments of dentine in the pulp cavity; periostitis, plastic or suppurative; impaction of permanent teeth in the maxillary bones; crowding of teeth from insufficient room.

"Each and all of the above-enumerated abnormities of teeth have caused manifestations of reflex nervous irritation, though, as I have remarked, they may exist in the severest forms without producing any such result.

"Mr. Salter then records a series of cases illustrative of the various pathological conditions referred to, of which we are forced to give the following brief abstract:

REFLEX AFFECTIONS.

"*Facial Neuralgia from Dentine Excrescence in Pulp Cavity.*—A woman complained of severe neuralgic pains obviously connected with an upper central incisor. The pain was of a gnawing character, abiding, but not constantly severe; frequently merely a consciousness of the presence of the tooth, but at other times sharp and darting, flashing up the side of the face, etc., through all the branches of the superior maxillary division of the fifth nerve of that side, and considerably augmented by sudden pressure, a tap upon the tooth, or marked change of temperature. The tooth was apparently sound, though somewhat elongated and slightly loose. No exostosis was

found on the root after extraction, but, on making a section of it (vertical, from side to side), an excrescence of dentine was discovered growing from the side of the pulp cavity and occupying, for a short space, more than half its diameter. The removal of the tooth, though accompanied with a violent paroxysm of neuralgic agony, was followed by a total cessation of the pain, which never recurred.

"*Cranial Neuralgia from an Impacted Canine Tooth.*—Miss B—— had 'cut' all the permanent teeth in due course and position, except the left upper canine, the proper space for which was obliterated by the contact of the lateral incisor and first bicuspid. At the time when the right upper canine appeared, a hard swelling was noticed in the palate, on the left side, and toward the front of the mouth, and this slowly developed into a prominent rounded ridge, extending obliquely behind the left incisors, and left first bicuspid. No inconvenience was felt up to the age of eighteen, when severe headache, confined to a spot on the vertex toward the left side, attended by local heat, etc., temporarily relieved by pressure, made its appearance. This headache, which was recurrent in its nature, lasted until the patient was twenty-six, no actual pain being felt in the impacted tooth, although the region about it became hot and tender upon the supervention of the headache. The removal of the tooth by Mr. Cartwright—an operation involving much chipping away of the bony cavity in which it was imbedded—was followed by *immediate and permanent relief*, thirty years having elapsed with no return of the symptoms.

"*Intense and General Neuralgia from Exostosis on Fangs of Teeth.*—Miss B. P—— had gone through her first dentition without trouble, but on account of some crowding on the advent of the permanent teeth, an upper and lower bicuspid on either side were extracted to make room. During adolescence she was attacked by neuralgic pains, at first confined to branches of the trigeminus, but afterward extending to the arms, legs, etc., indeed, nearly the whole body. The teeth, though apparently sound, had a tendency to elongate and spread, especially the upper incisors, with which the pain was at first chiefly associated. The offending teeth always gave pain on being slightly struck. Mr. Bell removed, from time to time, the teeth most obviously connected with the neuralgia, in each instance with temporary relief of the suffering, and in every case the fangs of the extracted teeth were found incrusted with nodular exostosis, though the teeth themselves were free from caries.

When Mr. Salter saw Miss P. (in 1851) only the two lower left bicuspids remained, and these were causing a continuance of the neuralgia, which ceased after their removal. On the fangs of both these teeth were the expected nodules of exostosis. This patient is stated to have been remarkably anæmic, the gums being 'like wax stained of the palest pink,' and the alveoli remaining white and bloodless for some seconds after extraction before blood enough oozed from the broken vessels to partially fill the hollow sockets.

"*Neuralgia of the Arm from Carious Teeth and from undue Pressure of Artificial Teeth.*—In the case of Mrs. E——, caries of any of the lower teeth on the left side has been immediately followed by severe neuralgic pain at a spot, small and circumscribed, on the front of the left forearm, about two inches below the line of flexion. Having now lost all her teeth, and wearing a complete artificial set, whenever the lower denture hurts the jaw on that side, the same symptom is manifested. The right side has never been similarly affected.

"*Chronic Trismus from Impaction of Lower Dens Sapientiæ.*—In a man aged twenty-three, with large teeth and comparatively small maxillary bones, the lower wisdom teeth were imbedded, and unable, from want of room, to come into place. The result was recurrent pain and swelling within the mouth, followed by a sudden attack of 'lock-jaw,' apparently caused by contraction of the left masseter muscle, which, after four months' duration, was cured by extraction of the left second molar, the wisdom tooth being out of reach. The posterior fang of the extracted tooth was much eroded by absorption.

"*Wry-neck from Carious Teeth of Lower Jaw.*—A young woman whose head had, for more than six months, been drawn down nearly to the left shoulder, with considerable pain, was relieved in a few days by the removal of a stump and a partially decayed tooth from the left side of the lower jaw.

"*Epilepsy from Carious Tooth.*—A boy, aged thirteen, under the care of Dr. Ramskill, had frequent attacks of epilepsy, occurring about seven or eight o'clock in the evening. Examination detected 'a molar tooth considerably decayed, with a swollen gum around it, and partly growing over into the cavity.' It was not very tender to the touch, nor did the examination give rise to toothache. The extraction of this tooth was followed by cessation of the fits.

"*Tetanus from Mechanical Irritation of the Pulp.*—The case of a gentleman (quoted from *Tomes's Dental Surgery*), who, having

broken off a front tooth, went immediately to a prominent dentist in Paris and had an artificial crown pivoted with a gold peg upon the fang. After severe pain for four or five days, trismus set in and was soon followed by tetanus and death.

"*Neuralgia of Face, Neck, and Arm, with Partial Paralysis of the latter, from Carious Wisdom Tooth.*—Miss W——, 'was suffering from constant aching pain in the left side of the face and neck, and in the left arm. The pain sometimes became intensely severe. The arm had lost nearly all muscular power.' These symptoms, after resisting all medical treatment for two years, disappeared in a few hours after the removal of the tooth.

"*Amaurosis caused by Crowding of Teeth.*—In this case (reported by Mr. Hancock in the *Lancet* of 1859, p. 80), a boy, aged eleven, whose sight had been previously unimpaired, found upon waking one morning that he was entirely blind. About a month afterward he was admitted to Charing Cross Hospital, where it was discovered that his teeth were 'much crowded and wedged together; the jaws, in fact, not being large enough for them.' Accordingly two permanent and four milk molar teeth were extracted, and 'on the same evening the boy could distinguish light from darkness, and on the following morning could make out objects. From this time his sight rapidly improved, and he was dismissed cured on the 28th (eleven days after), the only treatment beyond the removal of the teeth being two doses of aperient medicine.'

"'Dr. Watson (Lectures on Physic, fourth ed., vol. ii. p 351) mentions a very similar case. But the blindness was confined to one eye; it recurred two or three times, and was on each occasion cured by tooth-extraction.'

"*Deafness from Carious Teeth.*—Mr. Cattlin reports the case of a lady who had for about three months suffered acute pains in a diseased right lower molar, and in the corresponding ear and side of the neck, and who had been deaf for four days. 'The inflamed tooth was extracted, and hearing returned within an hour after the operation.'

"*Perverted Nutrition from Dental Nervous Irritation.*—Under this heading three cases are quoted from Mr. Hilton's work ('On the Influence of Mechanical and Physiological Rest, etc.'), in which the tongue was decidedly furred only on the side corresponding with carious or painful teeth; one in which the hair of the left temple was bleached by unilateral neuralgia, arising from a carious molar tooth; and one in which ulceration of the auditory canal, accom-

panied with offensive discharges from the ear, and enlargement of one of the cervical glands, was traced to a diseased lower molar on the same side, and subsided soon after the extraction of the tooth."

From the illustrations given, it will be inferred that the removal of any discovered lesion of irritation is the primary indication in every case of neuralgia. The idea has been advanced that there is seldom or never a neuralgia proper, but that such pain is simply an expression. It is unfortunately the case, however, that too often we are compelled to discover our weakness in a search after causes, and are thus rendered unable to treat a case scientifically, but are driven to empiricism. Even yet, however, we may render more than an accidental service; and the principle on which we would found such treatment is that of soothing and quieting, either as applications would refer to the system at large, or to the particular part involved. Nervines, where there is general nervous disturbance, independent, as far as we discover, of other derangements, will be found to sometimes act very happily. The tinctures of valerian and gentian, in equal proportion, given in tablespoonful doses, make a fine combination. Bromide of potassium, where it seems necessary to keep up a continuous impression, is given with advantage in doses of ten grains, dissolved in a wineglass of water, from two to ten times a day. If given, however, in a paroxysm, forty to sixty grains will be found not too much, and it sometimes will be well to combine with it small doses of opium or morphia.

℞.—Potass. brom. grs. xx;
Morph. acet. grs. $\frac{1}{4}$ to $\frac{1}{2}$, according to severity of pain;
Aqua, ℥i. M.
To be repeated pro re nata.

Valerianate of zinc is a favorite preparation with many practitioners. It may be made into pills with conserve of rose, or any preferred vehicle, each pill to contain from one-half to a full grain, to be given twice or thrice a day.

Tincture of Indian hemp is prescribed in doses of five drops, repeated three times a day.

Where there is disturbance of the visceral health, it has been found occasionally successful to produce rapid but moderate salivation.

Aconite made into quarter-grain pills, and administered cautiously, three or four times a day, is recommended.

Digitalis in tincture, or the tincture of veratrum viride, in condi-

tions of undue circulatory excitement, exhibited in five-drop doses until such excitement is subdued, will sometimes quickly relieve the pain.

Colchicum, where there is a supposed gouty association, may always be employed. The wine of the root is the best preparation.

In rheumatic neuralgia, or pain associated with a rheumatic condition, the following formula will be found very reliable; certainly so, if some other existing lesion is not too antagonistic:

R.—Potass. iod. ℥ss;
Ext. belladonna, gr. vi;
Vin. colch. rad. ℥ss;
Tinct. guaiac. ammoniat. ℥vi;
Aqua cinnamomi, ℥vi. M.

Sig. A tablespoonful to be taken in a wineglass of water three times a day; if it should purge, five drops of laudanum may be added to each dose.

Arsenic is frequently used with decided benefit. It may be exhibited in granules of the twentieth of a grain three times a day. It acts well in cutaneous neuralgia.

Donovan's solution—the liq. hydrarg. arsen. et iod.—is a favorite with many practitioners. Dose, five drops three times a day, avoiding salivation. It is an alterative, having a variety of significations.

Iron and bark should be employed in all cases associated with lassitude and anæmia.

R.—Elx. ferri cinch.
Sig. Teaspoonful four times a day.

Or,

R.—Tinct. ferri chl. ℥i;
Quinia sulph. ℥i. M.
Sig. 15 to 20 drops three to four times a day.

Or,

R.—Syrupus ferri pyrophos. ℥vi;
Quinia sulph. ℥i. M.
Sig. Teaspoonful four times daily.

Opium and ether, given in full doses before a paroxysm, with ten or fifteen grains of quinine administered after the pain has ceased, will, it is asserted, at once make an impression, and frequently

abridge the next paroxysm. Success is claimed for the exhibition of opium to the production of narcotism.

Muriate of ammonia, in doses of half a drachm three or four times a day, has been given with advantage. A very soothing effect is produced by placing a lump of the ammonia on a burning coal and thus impregnating the atmosphere of a room.

Oil of turpentine is frequently applauded by English practitioners. It may be given in doses of from one-half to a full drachm.

Chloroform, or chloroform combined with camphor, is recommended. A formula used by Dr. Wood is as follows:

℞.—Chloroform, f℥ij;
Camphor, ℥i.

Mix with the yolk of an egg and ℥vi of water, and direct a tablespoonful to be taken every half hour, every hour, or every two hours, according to the urgency of the case, until relief is obtained, or some decided effects are experienced from the medicines, either on the stomach or brain.

Vermifuge medicines are frequently prescribed with benefit, particularly in the case of children; parasites frequently keeping up an irritation, although presenting no definite signs. Of these medicines, one of the very best is the combination of spigelia and senna.

℞.—Syrupus spigelia et sennæ, ℥iv.

Sig. Take in teaspoonful doses three times a day. Four ounces will be enough to destroy any worms which may be present in the intestines.

Cathartics are generally indicated in spasmodic attacks of neuralgia; especially is this the case when there is costiveness, furre tongue, sick headache or stomach, giddiness, etc. It is generally satisfactory practice to precede the purgation with a few quarter-grain doses of calomel. The character of the purgative is to be influenced by the condition of the patient. Sulphate of magnesia is, I think, generally found applicable. Blue mass, colocynth, and jalap, or the compound cathartic pill, I have always found objectionable. Where febrile disturbance is present, particularly do I think these combinations will be found to do much more harm than good. The ordinary Seidlitz powder, repeated three or four times within the day, is a very happy and really refreshing medicine. If it should not do good, it will certainly do no harm.

Strychnine is an antineuralgic medicine of much reputation. It may be prescribed in quantities of two grains, divided into eighty pills. One to be taken three times a day.

Of local remedies there are the greatest variety. A formula long celebrated under the name of Rauque's liniment, is prepared as follows:

℞.—Ext. belladonna, ℈ij;
Ether sulph. ℥i;
Laurel-water, ℥ij. M.

Sig. Let it be rubbed on the part and saturated flannel be applied.

The endermic application of morphia is a common practice. The morphia may be used on a blistered surface, or subcutaneously injected,—syringes for the latter purpose being made by all instrument-makers. To make a subcutaneous injection, it is only necessary to thrust the needle-point of the syringe into the rete mucosum, or it may be passed completely beneath the skin into the underlying cellular structure.

Hot and moist applications are generally found of much service in quieting pain—the part to be enveloped in old and loose flannel, and evaporation prevented by an investment with oiled silk or other material.

In affections of the fifth pair, Dr. Richab, of Strasburg, attributes great good to one grain of quinine and two of common snuff, introduced into the nostril of the painful side. It is said in many cases to act like a charm.

Professor Charles Meigs introduced, several years back, a plan of treatment with sulphuric ether, which has yielded greater temporary success than anything else I have ever tried. He confused the nerve currents by taking a piece of sponge saturated with ether, and, by a continuous but irregular round, would touch, here and there, different neighboring surfaces, until the pain would disappear. If, for example, the pain was in the forehead, he would touch over the supraorbital nerve, over the infraorbital, over the anterior dental, over the facial, over the cervical,—alternating the touches to these parts for a period varying from five minutes to half an hour. In most cases the pain will, for the time, be relieved.

Creasote, much diluted in simple cerate, is sometimes found very useful as a local obtunder,—five drops of creasote to the ounce of cerate or lard to be rubbed over the affected part, little by little, until relief is obtained.

Dr. Kirby directs a liniment made of one drachm of tincture of aconite to seven of fresh palm oil, or with two ounces of camphor liniment. A half drachm of the former, or double the quantity of the latter, to be rubbed in twice or thrice a day, according to its effects. It must be watched, however, as the medicine is cumulative; if its poisonous effects appear, stimulants are to be given.

Dr. Grave's neuralgic plaster is compounded as follows:

℞.—Powder of opium, ℈ij;
Camphor, ℥ss;
Burgundy pitch, q. s. for plaster mass. M.

Stupe the parts with warm water before applying it.

Cazenave's pomade is thus made:

℞.—Chloroform, ℥iv;
Cyanide of potassium, ℥ijss;
Axunge, ℥iij;
Wax, q. s. for consistence.

Rub into the part a piece of the ointment the size of a pigeon's egg, and cover with oilskin.

"*Neuralgia: Cases treated successfully by the Spine-bag.* By John Chapman, M.D., M.R.C.P., M.S.C.S., Physician to the Farringdon Dispensary.—The cure of neuralgia, whether the disease be treated by drugs given internally, or by applications of various kinds at the seat of pain, or by the two methods conjointly, is confessedly almost always difficult, and in a large proportion of cases impossible. The cases reported below have been treated by a method altogether new. By stating each case with extreme brevity, I am enabled to present at one view within a small compass the results of several experiments; and I do this in the hope that they may produce such an impression on the minds of professional readers as may impel them to acquaint themselves with the pathological and therapeutical principles of which these results are an expression. I shall hereafter publish an exposition of these principles, illustrated by reports of cases *in extenso*, and shall then give a full description of the treatment adopted.

"1. *Facial Neuralgia.*—T. H., a gentleman, aged 35, who had been suffering during the previous fortnight, requested my advice March 18th, 1865. He was in great pain, which had been continuous from the previous day, and which had wholly deprived him of sleep. The pain was chiefly on the right side of the face

and head; but during the morning preceding my visit the left side had become invaded. The affected parts were very tender, and somewhat swollen. The head was rather hot, the face flushed, the tongue thinly coated with whitish fur; pulse 92, full and strong. Several medicines prescribed by two physicians in succession had proved of no avail.

"I applied a ten-inch spinal water-bag, containing water at 130° F., to the cervico-dorsal region, and shortly afterward left the patient's room. Within half an hour I returned, when I found him asleep. The treatment was continued for two days by means of heat; afterward I used ice (at first in the lumbar region), and from the time he first fell asleep he continued free of pain, which has not since returned

"2. *Facial Neuralgia.*—Fräulein S., aged about 25, consulted me February 3d, 1867, on account of neuralgia affecting the infraorbital and dental branches of the trifacial nerve. The pain was not confined to one side of the face, but was sometimes most acute on one side, sometimes on the other; it increased at night, and kept her awake the greater part of each night. She had been suffering in this way for about three weeks before I saw her. Her general health was good. The affected parts presented no trace of hyperæmia.

"She was treated by means of ice, and experienced almost immediate relief. After three days of treatment she felt and slept very much better; and before the end of the fifth day the pain had wholly ceased. Nearly a year afterward she told me that it had never returned.

"3. *Facial Neuralgia.*—Mademoiselle M., aged 20, consulted me in August, 1867, when she was suffering from acute facial neuralgia, the chief foci of which were the infraorbital foramen, and the mental foramen of the right side. The extreme pain came on in fits, sometimes at 8 A.M., sometimes at 2 P.M., but between the paroxysms the face continued to ache, and at times the patient had pain at the back of the head. She had suffered in this way about a fortnight before coming to me, and had several similar attacks during the preceding year.

"The treatment consisted in the application of the double-columned hot water-bag. The malady was immediately subdued: no distinct paroxysm occurred after the first application of heat; all pain rapidly and completely subsided, and since that date has not returned.

"4. *Dental Neuralgia.*—A. W. B., a Russian gentleman, suffer-

ing from dental neuralgia, consulted me in September, 1867. The malady was chiefly confined to the teeth of both upper and lower jaw, but no particular tooth or teeth seemed to be especially affected. The pain was intermittent, and so severe as to interfere seriously with the patient's daily occupation. No cause of the disorder, which had continued some weeks, could be discovered, and the face, so far from showing any sign of hyperæmia over the seat of pain, seemed cooler than normal. In the course of the first day of treatment by means of the spinal ice-bag, the pain was completely subdued; the cold was persisted in for some time, and during the remainder of the patient's stay in England he continued free from suffering.

"5. *Dental Neuralgia.*—H. E., female, aged 21, suffering from violent and continuous pain, spreading over the teeth and gums of both the upper and lower jaw, consulted me, January 17th, 1868. The pain was most intense in the lower jaw and on the left side; she had intense headache also. The forehead and cheeks were notably hotter than normal, and she complained of great heat in the roof of the mouth as well as in the gums—which were swollen and sore. During the previous week she had had several teeth stopped with gold: one of them became most especially painful, and there was threatening of an abscess at its root.

"The treatment consisted in the application of cold across the occiput, and of heat over the cilio-spinal region—in the first instance separately, and afterward simultaneously. The pain was speedily and completely annulled; it recurred, and was again annulled by the same method on several occasions. The patient volunteered the statement that, during the application of the heat, her mouth became perceptibly cooler.

"6. *Facial and Brachial Neuralgia.*—Mary A. T., aged 44, first consulted me at the Farringdon Dispensary, December 28th, 1867, when she was suffering from neuralgia of the right side of the head, face, and neck, and along the right shoulder and arm, extending to the fingers. The right half of the tongue was also affected. The pain, which was exactly limited to the median line, was described by the patient—'like as if something is pulling the flesh off the bone, it's so dreadful, and sometimes as if the parts were screwed up in a vice.'

"She was treated by means of ice applied along the whole spine. She improved immediately and rapidly, and as early as January 15th, informed me that she had not had 'a bit of neuraliga' during

the whole of the preceding week. Up to this date (February 29th) the pains have not returned."

Facial Neuralgia from Exposed Tooth Pulp.—Mrs. H. had suffered for several years with frequent intense and persistent facial neuralgia; had been under the care of four physicians; taken most of the sedative, antispasmodic, tonic, and alterative remedies which could be named; had been forbidden to go out of the house after sundown; was not allowed to put her hands in cold water, etc.

When consulted in reference to her condition, I requested that a thorough examination of her teeth should be made by a competent dentist, with a view of ascertaining if the trouble did not originate there. This was acceded to, but reluctantly, because *no pain had been felt in the teeth.* It was, therefore, with some show of gratification that I was assured subsequently that the teeth were all sound. I begged, as a special favor, another and more thorough examination, which, very much to my gratification, discovered an exposed pulp. This having been treated, the neuralgia disappeared, and has not since returned, a period of two years having elapsed. (*White.*)

Surgical Interference by Operation.—Interference by direct operation has not, as a general thing, been as satisfactory as could be desired.

Operative surgery in neuralgia refers to the division or resection of nerves. In facial neuralgia, where such interference is most frequently practiced, the history of the majority of cases has certainly not made sufficient offset to balance the risks incurred. It is certainly true enough that cases occur where it would seem that nothing else can be done. But when sections are made of healthy nerve cords one should be well satisfied that he has an otherwise irremediable condition in the nerve substance external to his line of section.

For these operations, and the mode of performing them, see chapter on *Resections.*

Anomalous Nervous Disturbances from Diseased Teeth.—As a continuation of the subject of reflex or associate disturbances, it may not be without advantage to add the following series of clinical observations, abstracted from various journals, which, from time to time, have fallen under my observation:

"Dr. B., a dentist, consulted me in reference to his eyes, which 'would not,' as he expressed it, 'focus together;' could see distinctly with either eye, but not with both at once; was unable, in consequence, to practice his profession; had consulted several phy-

sicians; been blistered, cupped, and had various applications made to the eye, but it was gradually growing worse. The pupil of the right eye was very much enlarged.

"I pronounced a carious and diseased first superior molar to be the exciting cause. It was extracted, with almost immediate relief and a permanent cure." (*White.*)

Facial Paralysis.—Dr. Chas. Bacon reported to the New York State Medical Society the following interesting case of facial paralysis:

"The paralysis occurred first on the left side, and was caused probably by irritation of the facial or seventh nerve, by the eruption of the dens sapientiæ of the upper maxilla of the same side, and exposure to cold. The swollen gum was freely excised, mustard pediluvia were employed, active catharsis procured, and the camphorated liniment with tincture of opium applied to the mastoid region and to the angle of the jaw, and subsequently electromagnetism to the same region was resorted to, followed by a blister to the mastoid region, the denuded surface produced by it being sprinkled, twice a day for two days, with one-eighth of a grain of strychnine, and then a few doses (fifteen drops) of a solution of three grains of strychnine in ℥i of alcohol, were taken. At the end of some seventeen months the paralysis had entirely disappeared. For about ten months the patient enjoyed uninterrupted good health, when he was again attacked with facial palsy of the right side. The gum of this side was swollen. A treatment somewhat similar to that pursued in the first attack was directed. At the period when the report was drawn up, about four weeks from the date of the second attack, the paralysis was lessened in extent, and the general health of the patient was good. The gum was less swollen but the tooth had not yet made its appearance."

"*Neuralgia with Deafness, cured instantaneously by the Extraction of a Tooth.*—M. Ed. Vautier records (*Gaz. des Hôpit.*) a case of this. The subject of it was a very nervous, slender woman, who had suffered for about four months with intense neuralgic pains, radiating through almost all the teeth, and also the muscles of the anterior region of the left side of the head. There was constant lachrymation of the left eye, and from the moment of the attack complete deafness in the ear of the same side. A number of physicians had been consulted, and sulphate of quinia, flying blisters, and atropia, in succession, tried without giving relief.

"When seen by Dr. B. she was suffering severely; had long been

deprived of sleep, and could not chew her food. The teeth were examined with care, but no one could be found carious. The wisdom tooth on the left side seemed, however, slightly painful on being touched, and loose. She was advised to have this tooth extracted, but with some temper refused. However, some days afterward, her physician again advising it, she consented, and the tooth was extracted by M. Vautier. The pains at once ceased, and her hearing was restored. A month has since elapsed without any return of her complaint. She seems to be permanently cured." (*Dental Cosmos.*)

"*Cases of Convulsions arising from Carious Teeth.*—St. Bartholomew's Hospital.—Notes furnished by Mr. Alfred Coleman:

"Case I.—L. C. G., aged seven years, a moderately healthy-looking child up to the age of four years and a half, when he had scarlatina severely, followed by glandular swellings. About four months since he was observed to avoid using his fingers, and would attempt to take up a cup between the backs of his two hands, for which his mother, thinking it was a childish trick, always scolded him and tried to make him take it up in the proper way, but without much success. Fancying his right arm was diminishing in size, she took him to Mr. Coote, who sent him to Mr. Coleman to examine his mouth. This was on a Saturday. In the afternoon of the same day, after having been seen by Mr. Coleman, the child was attacked with a fit of what his mother described as shivering in the right arm, the arm and fingers being drawn up as well as convulsed; his speech also seemed affected. Shortly afterward, this was succeeded by another fit of the same character, which commenced with a feeling of pins and needles in the right shoulder, extending to the arm and hand. From the Saturday to the Sunday evening inclusive he had ten such attacks. On the Monday he had an epileptic fit, which lasted two hours, soon afterward followed by another, which did not last so long.

"Wednesday.—The child has had no more epileptic fits; but the lesser seizures still continue, occurring very frequently. He appears much alarmed at them. His mouth and cheek are drawn up during a fit, and he cannot speak; but says 'Mother, it is going,' as the attack is leaving him. On this day Mr. Coleman extracted his four temporary second molar teeth, all of which were decayed, but had given him little or no pain.

"May, 1861.—Has remained perfectly free from the before-mentioned seizures since the removal of the teeth until within the last two days, during which he has had seven slight attacks. One of

the first temporary teeth was found to be carious, and it was removed about a week after this. His mother called and stated that he had one very slight attack since the removal of the tooth; she promised to bring him should a second occur, but neither mother nor child has been seen since that time.

"Case II.—M. J., aged about twenty-three years; is healthy-looking, and enjoys very good health; suffers much from toothache, and during the fits has a tingling sensation in the palms of his hands and soles of his feet, but especially in the left arm. Several of his teeth were decayed, but not so much so as to require removal; they were filled with gold, since which he has had no return of pain or the accompanying sensations."

"*Amaurosis consequent on Acute 'Abscess' of the Antrum, produced by a Carious Tooth.*—By S. J. A. Salter, M.B., F.L.S., Surgeon-Dentist to Guy's Hospital. Read before the Royal Medical and Chirurgical Society.—The case upon which this paper was based was one of unusual severity, and of exceptional complications. The patient, a young woman twenty-four years of age, was attacked with violent toothache in the right upper first molar, which was followed by enormous swelling of the side of the face, and intense pain. The eyeball then became protruded, and she soon after perceived that the eye was blind. Shortly after the establishment of these symptoms, 'abscess' of the antrum pointed at the inner and then at the outer canthus, and a large discharge of pus at both orifices followed; these orifices soon closed, and the general symptoms of the part continued unchanged—the swelling of the face, protrusion of the globe, and blindness. This state of things lasted for about three weeks, when the patient was sent to Guy's Hospital, and admitted.

"At this time the patient exhibited hideous disfigurement from swelling of the face, œdema of the lids, and lividity of the surrounding integument. Upon examining the mouth, it was found that the carious remains of the first upper right molar appeared to be associated with and to have caused the disease. Together with the other contiguous carious teeth, this was removed, and led, by an absorbed opening, into the floor of the antrum. The hemorrhage which followed the operation was discharged partly through the nose and partly through the orifices in the cheek, as well as from the tooth-socket, showing a common association of these openings with the antrum. The condition of the eye constituted the most important symptom, and the most distressing. The sight was

utterly gone; the globe prominent and everted. There was general deep-seated inflammation of the fibrous textures of the eye. The pupil was large and rigidly fixed; it did not move co-ordinately with the other under any circumstances. Some abatement of the symptoms followed the extraction of the tooth; but it was soon found that there was a considerable sequestrum of dead bone, which was removed. The necrosis involved the front part of the floor of the orbit, the upper cheek portion of the superior maxilla, with the infra-orbital foramen, and a large plate of bone from the inner (nasal) wall of the antrum. The removal of the dead bone was followed by the immediate and complete cessation of all inflammatory symptoms; but the eye remained sightless, and the pupil rigidly fixed. About five weeks after the removal of the dead bone, it was noticed that the pupil of the affected eye moved with that of the other, under the influence of light, though vision in it had not returned. The eye was frequently examined at this stage with the ophthalmoscope. All the structures, including the retina, appeared healthy, except the termination of the optic nerve, which was perfectly white and anæmic, while that of the other eye was pink and natural.

"The author referred to two other cases essentially similar to his own. The first (unpublished) occurred in the practice of Mr. Pollock, of St. George's Hospital. The patient had intense inflammation of the entire maxillary region on one side, caused by a carious tooth. It implicated the whole face and the contents of the orbit, but was not attended by 'abscess' of the antrum or necrosis of bone. The inflammation completely ceased on the removal of the tooth, but the sight was permanently lost; the pupil was at first fixed, but afterward moved with that of the other eye.

"Another example, closely resembling these, was published by Dr. Brück, in Casper's 'Wochenschrift' for 1851. It was, however, more chronic, and the loss of vision was only temporary.

"The author concluded his paper by suggesting that the serious ophthalmic symptoms depended on the nerves of the eye being involved in a plastic inflammation in their course, external to the skull and before their distribution; that the optic nerve was permanently damaged, as shown by the permanent blindness; and that the third nerve was temporarily implicated, as shown by the temporary fixedness of the pupil; and the eversion of the eye from the first seemed to indicate that the sixth nerve was less or not at all involved. Finally, the author left it an open question whether the anæmia of the optic nerve, as displayed by the ophthalmoscope, is to be

looked upon as a cause or consequence of its suspended function." (*Lancet.*)

Sympathetic Action.—In the course of an article on "Amaurosis and other Disorders of the Eye, resulting from Injury of the Terminal Branches of the Fifth Pair of Nerves," in the *Amer. Jour. of the Med. Sci.* for July, Dr. D. Lente gives the following interesting observations upon the sympathetic relations of the teeth and eye: "Middlemore says 'amaurosis may arise during the period of dentition; it may take place from the irritation of a carious tooth; from laceration or other injury of the supraorbitary nerve.' He relates a case in which Mr. Howship removed an encysted tumor from the scalp, which produced '*marked and permanent improvement in vision.*' Another case, in which M. Demours removed a tumor from the neighborhood of the eye, and thus *produced* amaurosis. Another from the *Edinburgh Medical and Surgical Journal*, 'which would appear,' he says, 'to prove that wounds of the *infraorbitary* nerve may *restore* the sight of an eye which has long been lost from an amaurotic affection.' 'A man was affected with perfect *gutta serena* of the right eye, and had the sight of the eye restored, he thinks, *in consequence* of receiving a smart blow in the neighborhood of the infraorbitary nerve of the right side of the face.' Another still more striking case, in which a person received 'a wound just above the right eyebrow from a piece of glass, which was removed immediately after the accident.' When the wound had healed, 'the sight of the right eye was very nearly lost; he has had a painful sensation in the neighborhood of the cicatrix, and a singular sense of creeping, and pinching and quivering of the upper eyelid and the integuments of forehead.' 'I made a free incision of the cicatrix down to the bone, and all uneasiness at once ceased, and the eye, shortly after, assumed its healthy character and functions, and *vision was permanently restored.*' Lawrence, after relating two or three cases of amaurosis following wounds and the formation of cicatrices over the brows, remarks: 'It is still a matter of doubt whether injury of the frontal nerve may cause amaurosis.' And yet, he adds, 'injury or other irritation of the trigeminus may bring on impaired vision or amaurosis.' 'The sympathy between the trigeminus and the immediate nervous apparatus of vision affords the only explanation of some apparently obscure cases, in which amaurosis seems to have depended on a carious tooth, or on some other local affection seated in the head.'

"The following remarks by Marshall Hall were reported in the

London Lancet for 1837–38: 'These experiments,' alluding to those made by Magendie, 'are not the only evidence we possess of the influence of the fifth pair on vision.' 'In an interesting case under my own care, a partial amaurosis of the right eye has arisen apparently from the caries of the upper canine tooth of the right side.' It was *augmented* by unsuccessful efforts at extraction. It has not ceased, however, since extraction was effected. 'These facts,' says he, speaking of this and other cases, 'with the similar results from wounds or tumors of the supraorbitar branch of the fifth, appear to me to confirm the extraordinary experiments of Magendie.' Hennen says: 'I have met with one or two cases of amaurosis from wounds of the supraorbital nerve.' 'Scarpa,' he says, 'doubts of the possibility of the cure of amaurosis from this cause, and mentions Valsalva's case as the only one on record.' Mr. Hey, however, states another in the *Medical Observations and Inquiries*, vol. v. M. Larrey mentions another, Vicq d'Azyr, who gives a case of amaurosis from a wound of this nerve, in the *Histoire de la Société Royale de Médecine*, Année, 1776, says he has 'since divided this nerve in quadrupeds, but without producing any such effect.'

"That defective vision may result as the direct consequence of irritation of the terminal branches of the fifth pair may also be inferred from the effects of remedial applications to these nerves, and from the phenomena observed to follow irritations and injuries of other branches not so immediately connected with the eye. Some of these instances it will be proper to mention. A friend of the writer, a distinguished surgeon of New York City, was incapacitated for business by violent neuralgia of the face; after having suffered some time with it, he noticed that one of his molar teeth was defective, and went to a dentist to have it examined; not supposing, however, that it had any connection with his neuralgia, since it gave him no pain. Its removal was advised; the operation was scarcely over before the doctor experienced complete relief from his excessive pain. 'I felt,' he said, 'as if I could have shouted for joy.' A lady, a short time since, applied to me to extract a tooth for her little daughter, which, she said, had been causing her excruciating pain day and night; but, on examination, I could discover no defect, and prescribed some anodyne remedy, which gave only temporary relief. A dentist was called in, who also declined extracting a sound tooth; but on a second visit, and a closer examination, detected an unsound tooth at some distance from the offending one, and extracted it. The pain instantly ceased, and did not recur. Mackenzie relates a re-

markable case in point. A man had violent neuralgia of the eye, soon succeeded by amaurosis, and continuing, notwithstanding various treatment, from the autumn of 1825 until the beginning of 1827. At this time M. Galenzowski, to whom he applied, 'found vision of the left eye lost and the pupil dilated. He extracted a decayed tooth from the left upper jaw, and, to his astonishment, and that of the patient, found, attached to its root, a splinter of wood, supposed to have been originally attached to a toothpick of wood. *Nine days after the patient had entirely regained his sight.*' Mackenzie relates another equally remarkable case, occurring in the practice of Dr. Van Zandt, of St. Louis, 'of a young man affected with complete amaurosis, excited by the persistence of two deciduous teeth. *As soon as they were extracted*, the patient looked up as if terrified, and *found his vision restored.*' 'Morgagni, Notta, Deval, Tavignot, and others,' says M. Echeverria, 'have known amaurosis to be caused by neuralgia, and to disappear as *soon* as the neuralgia was cured.' (The italics in the above references are my own.—L.). Such cases as these might be multiplied, but it is scarcely necessary." * * * * *

"There are several features in the rather remarkable history of Antoinette H. which require some notice before concluding this article. It was objected by a very distinguished oculist, to whom the case" [one in which part of a gun cap was accidentally driven into the pericranium of the left side of the forehead, producing amaurotic and other disturbance] "was related, soon after its occurrence, that the wound, being on the *left* side, the amaurotic symptoms should have affected the left eye, and not the right. But this is not more remarkable than that disease in one tooth should occasion a violent toothache in another perfectly sound; or that irritation of the nerves of the stomach by acidity should induce violent neuralgia of the supraorbital nerve; or that an irritating application to the mucous surface of the eyelid should determine also an immediate irritation of the Schneiderian membrane, succeeded by violent sneezing; or that simply touching the *membrana tympani* with a probe should sometimes give immediate relief to a toothache." (*Dental Cosmos.*)

"*Facial Paralysis.*—Dr. Coale reports the following case. The patient was a healthy, well-regulated girl, aged eighteen, who at first noticed that her face was somewhat stiff, and in twenty-four hours completely paralyzed on the left side. There was great distortion on laughing or talking, a staring left eye, and tenderness of the

whole left side of the face. The tongue was not at all affected, the disease being confined to the portia dura. No cause could be found for it, unless it were that she had defective teeth in each jaw, as much, however, on one side of the mouth as the other. The treatment consisted of leeches to the place of exit of the nerves, strychnia, etc., but with no benefit. After the lapse of three weeks, she was advised to have her carious teeth removed, and thirteen were accordingly extracted. This was followed by manifest improvement in the course of five days. Electro-galvanism was then gently employed, and the patient recovered.

"Dr. Tyler said that several years ago he had under his care a lady with severe sciatica, for which all the usual remedies had been tried in vain. Finding that she had several decayed teeth, he extracted four or five of them, with benefit. The remainder were subsequently drawn, after which the patient had no more pain.

"In 1853, a boy, aged nineteen, was brought to the New Hampshire Asylum in a state of mania. Dr. Tyler ascertained that he had had a tooth extracted some time previous, and that one of the fangs had broken off, and remained in the jaw. Suppuration took place, the pus discharging outwardly, and the boy was suddenly attacked with mania. The fang was removed. The fistulous opening closed, and the patient quickly recovered from his mania.

"In another case of mania, the patient being a young lady, several decayed teeth were removed. The patient remained to some extent under the influence of the ether, which was given at the operation, for twenty-four hours. After that she was cured of the mania."

Insanity is sometimes caused by Diseased Teeth.—James Trudeau, M.D., of Paris, says: "M. Esquirol told me that he had cured a young lady, who was insane, of her mania by the extraction of her second molar tooth, which was preventing the growth of a wisdom tooth."

Epilepsy from Diseased Teeth.—Dr. Rush ("Med. Inq. and Obs.") says: "Some time in the year 1801, I was consulted by the father of a young gentleman in Baltimore, who had been afflicted with epilepsy. I inquired into the state of his teeth, and was informed that several of them in his upper jaw were much decayed. I directed them to be extracted, and advised him afterward to lose a few ounces of blood at any time that he felt the premonitory symptoms of a recurrence of his fits. He followed my advice, in consequence of which I had lately the pleasure of hearing, from his brother, that he was perfectly cured."

Paralysis from Dental Irritation.—The *American Journal of Dental Science*, New Series, vol. i. p. 504, quotes from the *London Lancet*, as reported by J. L. Levison, of Brighton, the following case: "Miss ——, a young lady, was brought in a carriage to my residence, to have her mouth examined. On being removed, she was supported by a lady on one side, and a man-servant on the other, and her entire muscular system seemed paralyzed. Her legs trailed on the ground like useless appendages; her arms, when raised, fell powerless immediately, when unsupported; and even the muscles of the tongue were paralyzed, and in her efforts to speak, this important organ remained in a quiescent state. On examining the mouth, I perceived a *dens sapientiæ* of the lower jaw very carious, and deeply imbedded in the temporal muscle, just below the ridge of the coronoid process, in which locality there was extensive inflammation. I suggested the removal of the tooth; and though I had anticipated some advantage from the operation, the actual result astonished me. She instantly obtained the free use of her tongue, which she immediately used to communicate an important fact, viz., that ever since the tooth I had extracted had been making its way through the gum, she could date the gradual loss of power over her limbs, etc. I saw her about a month afterward; she could then use her hand and arm—she was writing a letter! Since then I have not heard what progress she has made."

Sir Astley Cooper, in speaking of the effects of slight irritation, says: "M. Toulmin, of Hackney, attended a lady on account of her suffering unusually from a diseased tooth, and she appeared to be afflicted with hemiplegia. M. Toulmin extracted the tooth, and in a short time the paralytic affection entirely subsided."

Catalepsy from Toothache.—The *Dental Recorder*, vol. viii. No. 1, p. 197 (1854), quotes from *The Stethoscope*, as reported by Dr. Huton, the following case:

"Willis, a plowboy (October last), was complaining of toothache early in the morning; half an hour after commencing work, was observed lying a short distance from the plow, apparently dead. He was carried to the house, nearly a mile, and the doctor (five miles distant) sent for. In the belief that the effect might be produced through the dental nerve, the tooth was extracted, when the boy immediately got up and expressed himself as well as ever; and has continued well since. He had been an unusually healthy boy, and had never had a physician to see him before."

The following interesting and suggestive cases were collated by

Dr. Abraham Robertson, of Virginia, and published in the *Dental Cosmos:*

"*Chorea is sometimes caused by Dental Irritation.*—The *American Journal of Dental Science*, vol. vi., New Series, p. 146, quotes from the *Dental News Letter*, the following

"Case.—Dr. Billard says, after an examination of the case, which was one of what is commonly called St. Vitus's dance, that he found several stumps in both jaws, the gums entirely covering some of them, and on pressure of the same, it caused her great pain, and pus exuded on the slightest pressure. * * * * * I proceeded to give ether, and it took a double quantity to make her insensible to pain. I then took out eight stumps and some small pieces of dead alveoli, which had caused a continuous irritation of the parts. Since that time, the author states, the paroxysms grew less frequent, and now the patient, Miss L., enjoys her usual health."

"*Erysipelas from a Diseased Tooth; Death of Patient.*—The following case was reported by Dr. Thompson of the 'Seaman's Retreat' (N. Y.), and furnished to the *New York Medical Gazette*, in which it was published, vol. iii. p. 263 (1852), by Dr. Sayer of that city.

"Case.—Charles Lunt, aged thirty, Swede, arrived June 28 from Havre. Admitted into hospital, at the date just mentioned, for an inflammatory tumefaction of left cheek and parotid gland, of three days' standing, as patient stated, from toothache, with which he had been annoyed for several days previous to the swollen face. Patient otherwise healthy and of a stout, robust appearance.

"On admission, the tooth of which he complained was extracted; there discharged, in cutting about the tooth, a considerable quantity of fetid pus. After extraction of the tooth, a powder of calomel and rhei was given, and an emollient poultice applied to the face. The latter was continued, and antiphlogistic remedies pursued, but without much relief to the pain or reduction of the swelling—when, after several days, the inflammation assumed an erysipelatous character. The affected parts were now painted with a strong solution of nitrate of silver, evaporating lotions applied, and the remedies indicated by the constitutional symptoms administered internally. This treatment persisted in, the inflammation, in a short time, greatly subsided, and these promised hopes of a speedy recovery. Suddenly, however, the erysipelas commenced to spread, and the accompanying symptoms to increase in violence, until the palpebra of the (left) eye and parts adjacent became involved. As the disease advanced, pus was

formed in several places, which was evacuated. The conjunctiva, partaking of the contiguous inflammation, became swollen and œdematous. The other tissues of the eye also soon became involved, and now occurred delirium and other symptoms indicative of the extension of the inflammation to the brain. This being apprehended, a vigorous revulsive antiphlogistic course of treatment was adopted, but without much relief to the patient. The symptoms just alluded to continuing, and gradually increasing in violence, the disease on the fourth day of their occurrence proved fatal."

"*Vicarious Menstruation from Decayed Teeth.*—Dr. Rush, 'Med. Obs. and Inqrs.,' says, in the second number of a work, entitled 'Bibliotheque Germanique Medico-Chirurgicale,' published in Paris by Dr. Bluver and Dr. Delaroche, there is an account published by Dr. Siebold of a young woman who had been affected for several months with great inflammation, pain, and ulcers in her right upper and lower jaws, at the usual time of the appearance of the catamenia, which at that period were always deficient in quantity. Upon inspecting the seats of these morbid affections the doctor discovered several of the molars in both jaws to be decayed. He directed them to be drawn, in consequence of which the woman was relieved of the monthly disease in her mouth, and afterward had a regular discharge of her catamenia."

"In the *Western Journal of Medical and Physical Science* for 1838, Dr. S. P. Hullihen reported the following

"Case.—Some time since a young lady, about seventeen years of age, applied to me with a fungous growth in each of the second molars of the lower jaw, which had assumed rather a novel character. She stated that the fungi had made their appearance in both teeth at the same time, about four years before, and that for the last two years she had been much troubled with a bleeding from them, which took place regularly once a month, and continued several days. She being very anxious to have the teeth saved, I destroyed, to all appearance, the morbid growth, and plugged the teeth. In a few days they became sore and painful, the plugs were removed, and a slight bleeding commenced, which continued three or four days, and then the tumors entirely disappeared. I was, therefore, induced to plug them again; but in about three weeks the teeth became sore, the plugs were removed, and a bleeding ensued as before. I now suspected it to be a vicarious menstruation, and mentioned the case to the family physician. At his request I plugged them again, and the result was precisely as before. The teeth were then removed, and

the patient was put under a course of treatment by her physician, which effected a cure."

"As somewhat allied to this I will here venture the opinion, although I have no case in mind by which to illustrate the fact, that other uterine diseases are often greatly aggravated, if not induced, by this same cause. And, improbable as it may at first seem, especially do I believe this to be true in relation to one of the most common afflictions—a very severe affliction, too—of the females of our country, prolapsus of the uterus.

"This much at least is certain, general debility, however induced, is a most common cause of this complaint, and I have often observed that when it is not complicated with other diseases, as inflammation, ulceration, etc., it may readily be cured, often by topical applications only, or by topical applications in conjunction with tonics and healthful exercise in the open air, and sometimes by the tonics and exercise without any topical treatment, or perhaps by Dr. Meigs's cure alone, of 'six miles walk a day, commencing with small doses, and increasing according to ability;' but if from any cause the general health afterward suffers, and debility ensues, a recurrence of the prolapsus will also be likely to ensue. And since diseased teeth, by the nervous irritation they produce, by the derangement they cause in the digestive and respiratory organs, are most common and potent cause of such debility, they must necessarily be the cause, indirectly at least, of this kind of suffering."

Epilepsy connected with Dental Irritation.—"I. D., aged thirteen, has had epilepsy eighteen months. Had no fits in infancy, no nervous affection up to the period of present illness. Family history good. First attack occurred after eating some crab-fish for supper. It was long and violent. The second occurred after two months' interval; cause of this not known. The third occurred in fourteen days, and they have recurred at varying intervals,—from one week to three weeks. They always occur during the night. He screams sometimes, and not unfrequently bites his tongue. Latterly his mother has noticed that some days he rubs his left cheek, complaining of faceache, after which the fit follows. He is a healthy-looking boy; tolerably well-fleshed, although the muscles feel somewhat flabby. He is intelligent, and does not appear to have suffered in apprehension or memory; no headache nor vertigo. Organic functions tolerably well performed; no inter-paroxysmal phenomena. On examining the mouth, there is to be seen a molar tooth considerably decayed, with a swollen gum around it, and partly growing

over into the cavity; it is not very tender to touch, and the examination does not give rise to toothache. On questioning, I find the sensation which the boy experiences before a fit does not seem to be one of pain, but rather of an indefinite uneasiness. He always has a fit the night on which this uneasiness comes on. Has never felt it during the day; it is always about seven to eight o'clock. I desired the mother to have the tooth extracted, and ordered a simple saline, with a quarter of a grain of belladonna, to be taken twice daily. This was in June. The tooth was extracted next day. I saw this boy once a fortnight from that time for four months, but he has had no recurrence of the fit.

"In this case I believe an unfelt aura commenced about the gum surrounding the tooth, and was not recognized till some degree of inflammation arose, and thus a modification of pain became associated with the aura, and directed attention to it. I have, at the present moment, another and very similar case to this. The extraction of the tooth has not yet been performed, so that I cannot give you the result. When epilepsy occurs in children, I always examine the mouth, with the twofold view of observing the vault as to height, narrowness, etc., inasmuch as no observation about the cranial development can be complete without such examination, and of ascertaining whether any cause of eccentric irritation may spring from decayed or crowded teeth. I would observe here that, later, the *dentes sapientiæ* often become a source of considerable irritation, and, therefore, of complication, at least in the epilepsy of young persons." (Dr. J. S. Ramskill, *Medical Times and Gazette.*)

CHAPTER XXXI.

WOUNDS OF THE MOUTH AND ASSOCIATE PARTS.

Wounds of the mouth and associate parts have, of course, the signification of wounds in general. Thus, some are of an incised character, being slits or incisions made accidentally or purposely by sharp-edged instruments; some are lacerated, contused, or torn, being made by dull and blunted instruments; some are punctured, being made by pointed but not sharp instruments; some are penetrating, as when the offending agent passes through the lip or cheek into the oral cavity. A wound may be of a compound or complicated nature, as, for example, in the case of blows or falls, which, while they cut and contuse the lip or cheek, break, at the same time, the teeth or fracture the jaw; gunshot injuries, lacerating or simply puncturing the soft parts, comminuting the hard; bites of rabid animals, introducing a virus; syphilitic inoculations, etc. Complications may also be considered as embracing hemorrhage and shock as primary associations; inflammation, with its varied phenomena, erysipelas, pyæmia, tetanus, etc., as secondary associations.

Every wound presents a first indication. If an individual receives a hurt which covers the injured part with earth or other foreign substance, such substance is to be washed or taken away as the primary step. If hemorrhage is the feature, arteries are to be ligated, or other necessary means taken to control such bleeding. If shock be present, this is the most immediate feature, and is first to be combated. If a rabid or poisonous animal has inflicted the wound, the destruction of the virus is a first indication.

Foreign Particles.—To remove earth or similar foreign particles, no better means can be employed than the simple sponge and water. Holding the injured part over a basin, squeeze water upon it from the sponge; if the particles are not washed away with the sponge closely applied, let it be lifted away, and the water allowed to fall from a distance. It is not, as a rule, at all necessary to permit the sponge to come directly in contact with a wound. Bodies which may not be washed away, no matter what their character,—

splinters, shot, balls, particles of powder, specula of bone, etc.,—are to be removed with forceps, scoop, or other convenient means, the rule being to allow nothing to remain that may interfere with the process of repair.

Hemorrhage.—A first matter to consider in hemorrhage is its character. Is it arterial, venous, or capillary? An arterial hemorrhage is known by its scarlet color, and by issuing from the wound in jets. Hemorrhage from a vein is dark, and has a gradual and regular flow. Capillary hemorrhage is an oozing. Arterial hemorrhage may require that the bleeding vessel shall be ligated. To do this it is only necessary to sponge away the blood until the vessel can be plainly seen; it is then to be taken hold of by the forceps, or caught in the tenaculum, and a strand of waxed silk thrown around it. In tying this silk, one must be careful that he shall not break his strand at either side of the knot, also that the tightening shall be sufficient to cut the middle and inner coats. To prevent tearing the vessel from its bed by the breaking of the ligature, the rule of holding the thumb upon the strands close to either side of the artery is always to be observed.

After ligating a vessel, one end of the ligature may be cut off and the other brought out from between the edges of the wound; this allows of an easy future removal of the knot.

Torsion of a bleeding artery is a favorite mode of treatment with many surgeons. The end of the vessel is to be caught by the forceps, and twisted. The author of the mode suggests that the torsion be continued until the end is twisted off.

Acupressure is another, and a very common method of treatment. A steel or gold needle is passed beneath the vessel in such manner as to tightly compress it against the neighboring parts.

Pressure by pad and bandage, when a hemorrhage about the face will not yield to simpler means, is a very satisfactory way of treatment, and one entirely reliable. All the vessels of this region rest upon a bony floor, and all of them, at certain points, are sufficiently superficial for the purpose,—the facial, at the notch in the inferior maxillary, in front of its angle; the temporal, just in front of the ear above the zygomatic process; the supraorbital, at the notch in the orbit; the infraorbital, at the foramen below the border.

A bandage of common application for any of these vessels is the crossed or knotted circular. A glance at the drawing will exhibit the manner of its employment.

It is, however, very seldom that any of these operations are ne-

cessary for the arrestation of hemorrhage about the face or mouth. Cold water thrown over the bleeding part from a sponge will frequently cause such a contraction, both of vessels and tissues, as to control it quickly enough. If water alone will not answer the purpose, let alum be added, as much as the water will dissolve. If even this should not answer the end, use a syringe, throwing a jet from

Fig. 92.—Crossed or Knotted Bandage.

a distance directly upon the part bleeding; this last will seldom disappoint. Monsel's solutions, so warmly lauded for their styptic qualities, have exhibited to me more ill results than I have ever met with from any dozen other articles. If used at all, I think the bleeding points should be alone touched; but of one thing any one using them may be assured: if the application does not control the hemorrhage instantly and permanently, he will have increased his trouble manifold.

A hemorrhage that is venous or capillary will seldom require more than an application of cold water. If this, or the alum-water, should fail, astringent medicines may be administered internally. Of the anti-hemorrhagic medicaments, none has ever stood me in better purpose than a tincture of the Erigeron Canadense; one drop to be given in a teaspoonful of water each minute. This dose seems like a very small one, but a larger administration has always appeared to me to do harm rather than good. Opium and lead I have used with much satisfaction, one grain of the former to two of the latter; three or four of such pills may be administered at intervals of from one to two hours each, if found necessary.

SHOCK.

Depression generally attends, to a greater or less extent, the reception of all wounds. Surgeons divide shocks into primary and sec-

ondary, or that which is immediate upon the reception of the injury, and that which does not exhibit itself until some later period. Shock is prostration; this may be simply of a nervous nature, implying functional disturbance; or it may be organic, implying injury of some vital part; it may again have the twofold relation.

In my own experience I have found few things more important to observe than the differences between real and apparent shock. One person, heavy and lymphatic in temperament, shall receive an injury mortal in its character, and yet, as the immediate or primary shock is concerned, affords less evidence of such injury than another of nervous temperament who may suddenly be called to look upon his wound. Mistakes, in such conditions, have very frequently resulted fatally to the persons most concerned. An article in the valuable work* of Prof. H. H. Smith, of the University of Pennsylvania, so tersely considers this important matter that I am sure no language could give it better expression.

"In the normal or healthy condition of the body," says Professor Smith, "each function is so well and accurately performed as to pass unnoticed by an ordinary observer. The moment attention is called by marked inconvenience to any one part, that moment its healthy action is changed, the duration of the disordered action varying greatly. When only interrupted for a limited period, the function may be again performed without any appreciable alteration, but when the interruption is of some hours' duration, the preservative action of life may be so impaired as to result more or less quickly in death.

"When any injury of a part is of sufficient magnitude to produce a marked derangement in the function of the local nerves, reflex action may induce such a depression of the general powers of life as will result in the state technically designated as *Prostration* or *Collapse*. This depressed condition is especially noticeable in the disturbance of the ganglionic system and its effects on the circulatory apparatus, and is shown either immediately or some hours or even days after the receipt of the injury. When apparent within a short time after the injury, the condition is designated as *Immediate* or *Primary Shock*, but when not developed until several hours or days subsequently, it is known as *Insidious* or *Secondary Shock*. In both there is a common feature of depression, the degree of which depends on the violence and extent of the injury, or the character and position of the part injured.

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* Principles and Practice of Surgery, by Henry H. Smith, M.D., etc.

"In the lighter forms of primary shock the patient trembles, is pale, faint, and with an anxious countenance; and much the same symptoms are said by Longmore* 'to be witnessed in the horse, mortally hit, no less than in his rider; the graver the injury, the graver and more persistent is the shock.' In marked cases the pulse is small and feeble or fluttering; the respiration somewhat oppressed and sighing; the skin pale and moist, with cold perspiration; while nausea, vomiting, and hiccough are also seen, and in some cases there is often well-marked convulsions. The disorder of the nervous system varies greatly, and is sometimes rather the result of mental than of corporeal action, as in a pistol-shot in an extremity not involving important parts, but in which the patient's mind, having been impressed with the danger to which he was exposed, continues for some time subsequently to influence his corporeal functions. The violence of the symptoms of primary shock, in connection with moderate injuries, will depend often on the temperament of the patient, and his mental condition at the time. If excited by passion, quite severe injuries will often pass unnoticed, while in cool blood the very idea of a simple operation will suffice, in some persons, to produce nervous prostration of a marked character, so much so as readily to induce syncope. In gunshot wounds of the lower extremities, and in severe railroad injuries, and extensive burns, the symptoms of shock are usually most marked. In these cases the patient sometimes loses his consciousness entirely, and becomes faint, exhibiting great mental disquietude, with absence of thought, and giving foolish answers, or incoherent mutterings. The skin is covered by a cold sweat, and is pale and flabby; the muscles are all relaxed; the arm, if raised, drops as if paralyzed; the sphincters of the bladder and anus permit the escape of urine and feces, and of this the patient is unconscious. Respiration is much disordered, and barely perceptible; the pulse hardly to be felt; the action of the heart feeble, or sometimes so faint as only to be heard by applying the ear to the chest; the eyes have a vacant expression; the eyelids when raised remain open from want of action in the orbicularis palpebrarum; the jaw drops, and the hearing is temporarily lost, or is stimulated only by loud noises—the patient remaining in this semi-dead condition for a period which varies greatly, as from a few minutes to hours, according to the extent of the shock. In the milder forms, with sufficient consciousness re-

* On Gunshot Wounds, Phila. edit., p. 45.

maining, there is only a mental commotion, so as to permit easy reassurance; but in the more marked degree this is often difficult, death sometimes supervening without reaction, though most frequently a certain amount of reaction is established and consciousness returns, or prostration again supervenes and the patient dies. When a limb is shot or torn away, or the body badly scalded, the local paralysis induced by the injury apparently prevents its immediate perception by the brain, and in numerous instances the patient has been ignorant of the loss of a limb until his attention was called to it. But as soon as the brain becomes cognizant of the injury, and the stage of depression or shock sets in, these apparently distant local injuries are attended by the symptoms just enumerated, though they are seen less quickly than when the injury involves the trunk or head. When the symptoms of shock are marked, serious internal injury may be diagnosed even though not apparent at the moment. In most cases of marked shock the power of deglutition is more or less impaired for the time, while even in the milder instances the patient experiences such difficulty in swallowing as will cause, when the attempt is made, the sudden spasmodic effort designated as a 'gulp,' or the portion partially swallowed is ejected with symptoms of strangulation, often evidently of a hysterical character. When consciousness is not so much impaired the patient may be able to control the pharyngeal muscles, yet those of the extremities will be so imperfectly regulated as to cause the limbs to tremble as if with fright, or as if exhausted by violent exercise.

"Duration.—The duration of the primary shock is very varied. In mild cases it disappears rapidly, the patient quickly recovering; the depression or the disposition to syncope passing away and leaving him feeble in his circulation as well as in his general strength. But in more marked cases, as in the crushing of a limb by a railroad train, or by machinery, or a round shot, the collapse lasts for several hours, when the powers of life rallying, *reaction* occurs, and there is a renewal of the ordinary functions of the nervous system, noted in the circulation, which now tends to excessive action as much above the healthy standard as the depression was below it.

"This reaction after the shock of injury, if not regulated by appropriate treatment, frequently creates a *hyperæmia* or congestion of the blood-vessels, and soon develops inflammation and traumatic fever. To prevent this, and keep the reaction from exceeding its proper bounds, and yet raise the flagging powers of life, is the important indication to be accomplished in the treatment.

"Treatment of Primary Shock.—In mild cases of shock, a few encouraging words, a mouthful of water, or wine and water, with judicious explanations of the limited extent of the injury, will often suffice; but in marked cases, when the patient's consciousness is impaired, and his powers of deglutition are temporarily paralyzed or much weakened, our means of reviving the action of the system must at first be limited to such remedies as can be applied without being introduced into the mouth. The best plan of treatment is, therefore, to dash cold water on the head and face; to excite artificial respiration by gently and quickly compressing the costal cartilages, or by the 'Ready Method' of Marshall Hall; by applying stimulating vapors, as strong ammonia, to the nostrils; by exciting the nerves of the skin by sinapisms applied especially to the epigastric and cardiac regions, and to the extremities; by applying heat to the surface of the body through hot bricks, bottles of hot water, etc., and by rousing the dormant action of the sympathetic nerves, through the bowels, by administering stimulating enemata, as oleum terebinthinæ, infusion of capsicum, etc., sufficiently diluted with water or mucilage to prevent the development of rectal inflammation. About ʒij of ol. terebinthinæ in a pint of soap-suds or salt water usually suffices.

"When by the continued use of these remedies the patient regains sufficient consciousness to be able to swallow, or when the depression has not gone so far as that just alluded to, stimulants may be cautiously introduced into the stomach. Of these, such should be selected as are not likely to induce congestion of the cerebral vessels; hence ten or fifteen drops of the aromatic spirits of ammonia in a little water, repeated every ten or twenty minutes, answers better than alcoholic liquors, unless the latter are given in moderate quantities, and their intoxicating tendency carefully guarded against.

"As the pulse begins to respond to these measures, the use of both external and internal stimulants should be omitted, the natural tendency being to a reaction that must be restricted to proper limits. Should the pulse become full, hard, and frequent, so as to indicate febrile reaction, cold drinks, cold sponging, saline cathartics, and arterial sedatives, such as five drops of the tincture of veratrum viride every hour, may be necessary—the powerful action of the latter remedy requiring its cautious administration, so as to repress but not depress too much the action of the circulation. The strong tincture of aconite root, in doses of two drops, or of tinct. of digitalis,

in the dose of ten drops every two hours, for a few hours, may also be advantageously used, if carefully watched and omitted as soon as the force and frequency of the pulse indicate their sedative action. By judicious attention to the proper action of the circulation in these cases, carefully stimulating the patient when in the collapsed or depressed condition, and inducing sedation when the reaction becomes excessive, patients may be rallied from the shock of injury and subsequently treated as demanded by the peculiar nature of the case. In that mild degree of shock, sometimes seen in patients who have been shot by a bullet in the extremities, or struck on the testicles or in the pit of the stomach, which is characterized by faintness, trembling, and mental anxiety, a little cold water, or wine and water, with a few words of hope as to the result of the injury, often suffices.

"In many severe injuries, and especially in those which involve the main trunks of large nerves, or the spinal cord, or a great extent of the surface of the body, there is sometimes noted, at varying periods after the reception of the injury, a train of symptoms of a marked character, that are very justly spoken of as those of the secondary or insidious shock of injury.

"*Symptoms.*— The symptoms of insidious shock are often so masked as to escape the attention of an inexperienced observer, until they are so far developed as to render it difficult to rally the forces of the patient. Thus when a limb has been torn off by a cannon-ball, or in a rolling-mill, or a thrashing-machine, or by a railroad train, the patient not unfrequently appears to be almost unconscious of the severity of his injury, the local paralysis being so perfect as to prevent the excruciating suffering that such an injury would otherwise create. In the case of the railroad accident, by the collision of opposing trains on one of our railroads, I saw a young man who had his arm cut off near the shoulder-joint, with so little suffering as to be unaware of the extent of the injury till his clothing was removed. By great care he subsequently recovered.

"In numerous instances in the experience of all surgeons, such patients have presented the following symptoms: immediately after the injury they are remarkably cool, self-possessed, and as if endowed with indomitable fortitude; the pulse is often barely accelerated; the respiration quiet and natural; the skin pleasantly warm; the mind clear, though perhaps a little torpid, but apparently with perfect consciousness. In some cases patients have been known to walk or ride some distance, evidently unconscious of injury, till suddenly faintness supervenes, and they fall to the ground, and die in

the course of an hour, more or less. In other cases, where the external wound or injury is more evident, they will give directions for their removal, arrange their bed, business, etc.; reply to questions rationally, and with great composure; yet, as has been well described by the late Dr. George McClellan,* they will present a countenance that is altogether unnatural, having 'an inquiring, anxious look about the forehead, eyes, and upper portions of the face, while all about the mouth is smiling and composed.' In addition to which 'they look with a stare of alarm and suspicion at the surgeon when his attention is called to them.'

"After this period of treacherous calmness has existed from three to eighteen hours, the expression suddenly changes; the lips become livid or deadly pale; the blood leaves the surface of the body; the pulse flutters and becomes too rapid to count; the respiration is short and panting; a great sense of oppression distresses the patient, and he sinks slowly, as if suffocated, or dies as if struck by lightning. In these cases the foundations of life are undermined, and the paralysis, which was at first limited to the part injured, suddenly extends to the nervous centers, and life is arrested by the want of proper nervous force.

"*Prognosis.*—The prognosis in cases of severe injury, in which the patient is thus unconscious of suffering, cannot be too guarded, the patient not being out of danger from insidious shock until after the lapse of forty-eight hours of perfect tranquillity. In the majority of such cases, when secondary shock supervenes, death ensues.

"*Treatment.*—The treatment of secondary or insidious shock should be chiefly prophylactic, special attention being given to the preservation of the powers of the nervous system by the administration of food and stimulants, while all muscular action on the part of the patient should be carefully guarded against.

"In many cases it will be useful to give milk-punch, beef-tea, quinine, carbonate of ammonia, chalybeates, etc. as often as possible, until some evidence is shown of their effect upon the circulation. Then, while the patient is strictly confined to the recumbent position, stimulating frictions should be made along the spine, cold applied to the head if it becomes hot, pediluvia or hot bottles applied to the feet if cold, and access given to a sufficient amount of fresh air in the chamber to favor active respiration, while the patient is at

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* Principles and Practice of Surgery, p. 18. Phila., 1848. Edited by Dr. Jno. H. B. McClellan.

the same time kept warmly covered up in bed. By such means the occurrence of secondary shock may be prevented; but should it supervene, nothing but powerful stimulants to the spine, or the administration of ether, brandy, tincture of capsicum, etc., with the free use of beef essence, affords a hope of checking the rapid prostration that, if not watched, will carry off the patient. In every case of serious laceration of a limb, opening a large joint, tearing nerves, etc., cautious watching of the pulse can alone guard against the development of insidious shock. If the patient is disposed to sleep, let the pulse be noted, and let him be awakened every hour to take nourishment, if the pulse begins to flag. As the symptoms of shock are usually the result of serious and extended injury, the question of the propriety of operating for the relief of the injured part will often arise. Unless in the case of the laceration of blood-vessels from which the blood oozes, the opinion of most surgeons is adverse to the propriety of operating until *reaction* is fully established; and since unconsciousness can be readily induced by the use of anæsthetics, the supposed advantages derivable from amputating a limb while the patient was unconscious of the injury, are generally regarded as evidence of a want of judgment on the part of the operator. How soon after reaction an amputation should be performed, will depend on circumstances, and be again alluded to when speaking of the advantages of primary over secondary amputations.

"Occasionally it happens that after reaction is established and traumatic fever supervenes, the patient becomes delirious, or traumatic delirium or wandering, without fever, is met with. If this delirium is an attendant on the febrile condition, sedatives, cooling applications, and the judicious use of opiates, with antiphlogistic remedies, as antimony, arterial sedatives, and such others as are adapted to inflammatory fever, will be required; in other cases opiates are mainly sufficient. Should delirium tremens supervene, the usual treatment, as described in treatises on the practice of medicine, with great attention to the seat of injury, will be requisite. Among high livers or in the intemperate, a comparatively slight injury will often induce an attack of delirium tremens, requiring opiates and stimulants to counteract it, or, if the pulse is exceedingly frequent without prostration, the administration of large doses of the tincture of digitalis or veratrum viride. In delirium tremens supervening on pistol wounds, in many of our volunteer soldiers in camp for the first time and deprived of their habitual drams, I have

seen marked benefit derived from the administration of half an ounce of the tincture of digitalis every four hours until three doses are taken, this apparently heroic treatment sometimes inducing a perfect cure in thirty-six hours. As the dose advised is very large, the pulse should be cautiously watched before it is repeated."

Virus.—If a rabid dog, or other animal, bite the part we are considering, or any part,—if a poisonous serpent strike its fang, or even if the loose kiss of the chancrous lip inoculate,—a first indication is to get clear of the poison. How? It is now very generally accepted that the immediate application of solid nitrate of silver to the parts wounded will neutralize these poisons, or that, at any rate, it will so alter the condition of the wounded part as to slough off the offending agent, and prevent its absorption. If an escharotic is not at hand, and this, at the moment, would be not unlikely, such a wound may be cut away. Suction is also an admirable prophylactic (not as the chancre inoculation is concerned, there would be here no immediate hurry) for most poisonous introductions. The danger to the person sucking such a wound would be very trifling; any danger at all depending on a casual abrasion that might at the time be present about the mouth or lips. Excision of bitten parts is frequently practiced. I recall an occasion, several years ago, where an enraged rattlesnake escaped from an experimenter, striking its fangs into a colored assistant standing by. Without a moment's hesitation, the gentleman excised the part; no harm ever came of the matter. Tiding a patient over the depression of rattlesnake poison by the stimulus and specific effects of whisky, has received so many confirmations as to have become a matter of common knowledge. In my own practice I have had on several occasions to excise poison wounds, and all have been successful. Without exception, however, the wounds excised have been received through some intervening substance, and such substances may have prevented the introduction of any poison.

Healing Wounds.—Primary indications met, the second question is the healing of a wound. Every wound heals by granulation. The difference between a healing by first intention and a healing by second intention is only a difference in degree. An incised wound, delicately and accurately approximated, heals with so little new inter-tissue that Mr. Paget mentions cases where no line of difference was discernible even under the microscope. A healing by second intention, so called, may require so many granules to fill up a gap that the new or cicatricial tissue is observable at a great dis-

tance, as is frequently witnessed in scars from burns. An indication, then, of the utmost importance to be met in wounds about the face, is the avoidance of a necessity for new tissue. To accomplish this, every wound is to have its parts as nearly approximated as possible, and the associated vascularity modified, or at least controlled.

How wounds are best approximated is a matter which is always eliciting discussion. The common methods are by stitches, plasters, and compresses. An incised wound, of limited extent, about the cheek, seldom needs more than that a strip of adhesive plaster shall be thrown across it. If such a wound occupies the position of the lips, and shall have made a complete separation, adhesive plaster will not, perhaps, be found sufficient for the purpose. To insure the least scar, a stitch may be used to approximate the free edges, and the parts then forced and held together by placing two lateral compresses at the sides of the wound, and supporting these with a turn of the circular bandage; or it may be found that, after the stitch, the adhesive strips will answer the purpose. Pins, with a figure-of-8 turn about them, make a very nice, reliable, and accurate adaptation, and, if not kept in too long, leave very little scar.

A mode of approximation, which will be found very satisfactory, consists in using a suture of silver wire, and bringing the edges of the wound together, as directed in cleft palate. An objection, however, it must be admitted, to all pins and stitches, lies in the fact of new wounds being made,—an irritation being begotten by the presence of the foreign body, which is very apt to provoke more or less suppuration, thus making other scars, as is witnessed so frequently in operations performed for hare-lip; therefore it may be set forth as the best practice, that any means which breaks the flesh should be avoided, if any other may be made to answer. Silver or lead wire is preferred to the waxed silk, only from the fact that these metallic agents seem to irritate less, and are, therefore, not so likely to make points of suppuration, and consequently scars.

When pins or stitches are used, they are to be left in place only so long as is absolutely necessary. This time will, of course, depend very much on circumstances. If an incised wound does as well as it may, sixty to seventy hours will usually be found sufficient for the union, while instances enough exist where, in this time, the process of repair seems scarcely to have commenced. A very good way to obtain information is to sponge off the wound, and to be instructed by the line of approximation; if this continues to show its incised nature, the pins are not to be disturbed; if, on the contrary, it is a

fleshy line of comparative solidity, the pins may be removed,—the parts will hold.

The withdrawal of a pin or ligature is a matter demanding delicacy of manipulation. It is frequently, and indeed generally, the case, that more or less blood-rust collects upon a pin, making the removal a matter of such difficulty that, unless the precaution be taken to scrape away such rust before making the attempt, a disturbance of the cicatrix is almost inevitable. In the withdrawal of a pin, an important matter is the rotation of it; such rotation facilitates the removal wonderfully. Metallic ligatures are generally disturbing; the proper plan to take them away is to cut the wire at the side of the spot or knot opposite to that on which it seems desirable to withdraw it; the end is then to be carefully straightened, so as to place it on a line with the part in the wound; support is to be given the cicatrix by a finger applied on either side, when, with a rotatory movement, the wire is to be drawn away. In the use of the pin and figure-of-8, a very excellent plan is, on the removal of the pin, to allow the blood-matted silk to remain glued to the wound; it serves very much to hold the parts together, and is entirely void of any offense as a source of irritation.

When plasters are used, it is a necessity to have all hairs shaved away and the parts perfectly dry. The ordinary adhesive kept on sale by every druggist, composed of resin and lead plaster, is perhaps open to as little objection as any. It is to be applied in strips of convenient length and breadth, and rendered adhesive by holding, for a moment, the back of the strip over a vessel of hot water. There are skins, however, which this plaster irritates and inflames; when cases of the kind are encountered, it is well to employ the isinglass plaster. An objection to this plaster is its tendency to curl, and roll up. It is applied by moistening the glazed surface with water.

In the use of plasters, it is a good rule to allow a space between each strip; this not only keeps the wound exposed to observation, but permits of easy drainage. An only exception to such rule is found in small cuts where it is thought desirable to use collodion. This mixture of gun-cotton and ether is applied either directly over a cut—first nicely approximating the edges, and holding the parts together until the ether has evaporated—or indirectly through the agency of saturated slips of gauze or other convenient material.

The removal of a plaster is to be effected by drawing the strip

from either side toward the wound; such a removal being accomplished without any strain upon the cicatrix, the line of union being, of course, supported by the thumb and forefinger of the other hand. If a wound seems to be doing well under plaster, there need be no special haste in its removal. It is usually the case, however, that such a dressing will not continue to do service longer than two or three days. In simple incised injuries, this is generally all that is required, but in lacerated wounds, dressings are demanded an indefinite length of time, and require continued renewal. In reapplying a dressing of adhesive strips, a good plan is to displace and replace one at a time.

Complicated Wounds.—The history of a few cases may, perhaps, best serve to illustrate practice in this direction.

Case I.—Little girl, of remarkably perfect temperament, about four years of age, brought into the office with quite a gash in the lower lip, and the six anterior teeth knocked directly back; considerable hemorrhage.

Treatment.—Checked the hemorrhage, and cleaned the parts by the free use of cold water applied through the syringe; pushed the teeth back into their unfractured alveoli, and retained them in place by laying a delicate roller over them, fixing it beneath the chin. A single stitch of waxed silk was placed in the wound of the lip. The case was dismissed for the day, with directions to keep the parts refrigerated through a continuous application of cold water.

Second day. Same treatment continued, the band over the teeth being replaced by a fresh one.

Third day. Wound in the lip healed sufficiently to remove the ligature. Teeth somewhat tightened; very little inflammation; continued the bandage, but left off the application of the water.

Fourth day. Removed the bandage. Teeth very sore, but doing well, and quite fast.

Eighth day. Patient dismissed; some soreness still in the teeth, but needing only time to bring them to full health.

This case was seen three months after the accident—there was no discoloration of the teeth, and not the slightest evidence that any harm had been done them.

Case II.—Child six years of age. Four front inferior teeth knocked loose by a blow from a ball; some contusion of the lip, but no break in the continuity; very little bleeding.

Treatment.—Removed the injured teeth; absorption having pro-

gressed to a considerable extent, applied to the lips dressing of cold water; case well enough to dismiss next day.

Case III.—Little boy, five years of age, fell upon a curbstone, fracturing the superior alveolar process. Examination revealed six teeth movable in mass, the fracture extending from tuberosity of right side to canine fossa of left. The accident occurred nine hours before recourse to treatment.

Condition.—Child feverish and restless; pulse much excited; soft parts about the seat of fracture considerably swollen, and so tender as to cause the little patient to scream when the parts were touched.

Treatment.—A Seidlitz powder; hot pediluvia; the mouth syringed with cold water; iced lemonade, *ad lib.;* spts. Mindereri, ℥ij, $\frac{1}{16}$ gr. acetate of morphia. This was the treatment on the afternoon and night of accident.

Second day. Hot pediluvia; iced lemonade, made of crushed ice; mustard poultice at back of neck.

Third day. Swelling of gums very much abated. Fed the child freely with spoon food, then brought the fractured part to its place by reducing to proper articulation with lower teeth, and retaining in position by means of the yard strip modification of the Barton bandage—a fairly comfortable day was passed. In the evening the bandage was loosened, the child again fed, the bandage tightened, patient put to bed—a comfortable night was passed.

Fourth day. Doing very well. On loosening the bandage there was very little tendency in the fractured part to move of itself; child fed with soup food; mouth well syringed with cold water; bandage reapplied. Patient played about the room most of the day, taking lemonade and rice-gruel very frequently, by placing the fluid within the lips and sucking it between the teeth.

From fifth to tenth day did little more than continue the treatment of the fourth.

Eleventh day. Removed the bandage. Fracture fairly solid; able to hold of itself; liquid food continued; no other treatment.

Fifteenth day. Patient began to eat solid food; passing on, without further treatment, to a good cure.

Case IV.—Little girl, three years of age, markedly scrofulous; lip cut through; fracture of process of central, lateral incisor, and cuspid teeth of left side inferior maxilla; cutting edges of teeth thrown backward.

Treatment.—The wound in the lip being quite extensive, a hare-

lip pin was inserted, and the parts pushed together and held with a figure-of-8. The fractured process was restored to position, and retained by tying the one end of a strand of waxed floss silk around the last molar tooth of the injured side, bringing it forward, passing it between the first molar and cuspid of the fractured part, back of the three teeth of the broken process, then out between the central incisors, and back to the first molar, where it was tied. This ligature supported the part in its place very well. The ferrated elixir of bark, in doses of twenty-five drops, directed three times a day.

Second day. Wound in the lip doing tolerably well; seat of fracture looking puffy, and asthenic. Very weak solution of compound tincture of capsicum ordered to be thrown, ter die, over the part.

Third day. Looking worse; ligatures cutting into the gums; patient refusing solid or soft food; took away the ligature; tempted the appetite with ice-cream and jellies; scarified the puffy gum.

Fourth day. Matter oozing from about seat of fracture; etherized the child; dissected down to the fractured piece, and removed it.

Sixth day. Very much improved; wound healing fairly; continued to syringe with the dilute capsicum comp.

Eighth day. Case well enough to be dismissed. The pin in the lip had been removed on the third day. The wound gaped some little; but the removal was a necessity, on account of irritation produced by its presence; support was given by an adhesive strip, after the taking away of the pin, and the part stimulated with capsicum, under which it healed very rapidly.

Case V.—M. L., an iceman, aged perhaps thirty-five, brought into the office immediately after having been kicked on the mouth by a vicious mule. Patient very pale and faint. Examination revealed comminuted fractures of the alveolar process of both jaws, with the teeth knocked into every position.

Treatment.—First, stimulation with a little brandy. The patient revived. Incisions on either side of the teeth were made down to the bone, and some eight pieces removed, with the teeth associated. No hemorrhage of consequence attended the operation, and in the course of three or four days the man was going about his business, —no treatment, outside of the free use of cold water, having been indicated or employed.

Case VI.—C. H., struck over the angle of the jaw by a Minié-ball, which plowed across the face, completely dividing the cheek, and grooving the right nasal ala. A first treatment employed on the field, where the injury was received, consisted in associating the

severed parts with a series of interrupted sutures, and the application of a poorly adapted bandage. In this condition the patient was sent several days' journey, to a hospital in which I happened at the time to be employed. My first observation of the case exhibited an immense wound, stiches all torn out; superior maxillary bone exposed, with groove cut into it; suppuration most profuse; patient exhausted, irritable, and feverish.

Treatment.—The weather being oppressively hot, a large basin of water was brought, in which the head and face were thoroughly, yet tenderly, washed. The matted hair was combed out and arranged. This refreshed him very much. Examination of the wound was commenced. On the groove in the bone was found no splinter, nor other indication adverse to the direct and immediate overlying of it by the soft parts. Attention to the line of wound in the soft part exhibited that the slough, which must necessarily have ensued from the passage of the ball, had completed itself, and that a process of repair was attempting to inaugurate itself. Indications thus being rendered very plain, the whole of the cut and suppurating surface was slightly stimulated by an application of dilute tincture of iodine, and then carefully moulded into place and approximated. The maintenance of this apposition was accomplished by fitting a compress to the cheek, and also below the wound, and with a bandage carefully lifting and supporting it; no stetchers, pins, or plasters being employed. The success was perfect, the whole line of the wound being exposed, permitting the fullest and most frequent examination. In ten weeks the parts had united so firmly as to allow of the removal of the compress and bandage. The only medication employed consisted in the administration of an occasional Seidlitz powder, and a daily glass of porter, with repeated applications to the wound of the dilute iodine, one part of the officinal tincture to four parts water.

Case VII.—Little girl fell over the shafts of a wagon, cutting her tongue, in some unappreciated way, directly in twain, for the distance of an inch down the middle. Hemorrhage very profuse, requiring the ligature of a vessel. This wound was united by two stitches of the interrupted suture passed deep in the substance of the organ; cold water directed to be held, quite continuously, for the first day in the mouth; patient fed on ice-cream and jelly. Third day, stitches removed, union complete, ligature loosened, and was pulled away on the seventh day.

Case VIII.—Brigadier General D., standing upon an outlook, was struck by a sharpshooter, the ball passing through the right ramus

of the lower jaw, shattering the bone, passing forward across and through the tongue, emerging from and splintering the body of the bone on the left side. The treatment pursued upon the field had been to check an alarming hemorrhage from the region of entrance of the ball, by stuffing the wound with charpie saturated with Monsel's solution of iron, throwing a bandage over it, and hurrying the patient to the hospital.

Condition on entrance.—Patient arrived, and was put under my care about eleven o'clock at night; complained, by writing on a slate, of great thirst, with entire inability to swallow, and of the painful effort it required to breathe; had not been able to drink since the accident, which happened two days before.

Treatment.—Examination revealed marked displacement of the middle piece of the fractured bone. This, with the tongue, being pulled backward by the hyoid attachment of the genio-hyoglossal muscles, sufficed to explain part of the difficulty in respiration and deglutition. The tongue itself, however, was much swollen, and had a ball wound through its base. Two primary indications thus presented: to keep the body of the bone and tongue in position, and to reduce the swelling in the tongue. The external wounds were for secondary consideration—the patient had to breathe and had to be nourished. The mouth was first well syringed with cold water, which was most refreshing to the patient; the bone was then brought forward, the inferior teeth in front of the superior; the jaws were closed, and held together by a delicate bandage, the middle fragment being thus retained even in front of its natural position, and pulling the tongue forward with it. This accomplished, the patient was propped up in an arm-chair, and his feet immersed in hot water, the application being continued until every vein and capillary was engorged. A local abstraction of blood was not thought desirable, as he had already lost as much as he could well spare. The result of such a primary treatment was, that in half an hour the patient was able to swallow spoonfuls of lemonade. This drink, cold as it could be made, was continued during most of the night, serving, by its refreshment, to give much comfort, and by its refrigeration to abate the vascular excitement. About four o'clock in the morning the patient fell into a disturbed sleep, which continued until eight. At nine o'clock the tongue was examined by separating the lips, and looking at it through spaces which existed between the teeth; the swelling and turgidity had very much diminished. The feet were again placed in hot water, and the blood held in the parts until a

sense of faintness was experienced. This gave increased relief. The patient thus being over the immediate danger, attention was directed to the state of the external injuries, and the line of passage of the ball.

The wound at the external angle of the jaw was found to occupy quite a space in the parotid fossa, the ball having been received evidently as the general had turned his head to address some one behind him. It was stuffed with charpie, looking now a black and blood-infiltrated mass, and which evidently had been thrust hard and solidly into the wound, and now had swelled to double its former size, displacing the parts to a very marked extent. This plug being firmly fixed, it was left to be removed or not, as circumstances should seem to direct, at a future time. The wound of exit was larger than might have been expected, spicula of bone having considerably torn the parts; from this was removed several small splinters. The probe, passed into this opening, revealed the line of the wound, running through the base of the tongue obliquely across the mouth. An only treatment consisted in the free use of permanganate of potash and water. The patient passed the day in a fair degree of comfort.

A sudden secondary hemorrhage being the next thing to fear, it was determined on the third day to remove the plug; this was accomplished only after a full hour of labor, the charpie having wedged itself into every imaginable space, the removal being effected by the very free use of milk-warm water and the most gentle of traction with the forceps and scalpel handle. The removal was attended with considerable pain, but without the loss of a single drop of blood; the relief from the sense of pressure afforded was so very great as to change the whole appearance of the patient, he now breathing and taking his beef essence with the greatest freedom. The appearance of the wound was really very promising, attempts at granulation being quite evident, while nothing especially threatening was to be observed. The day after this dressing, the patient, in opposition to all advice or commands, insisted on being passed to his family in Washington. All the dangers of secondary hemorrhage were exposed and explained to him, but he seemed to be possessed of the single idea of getting to his home. At five o'clock in the afternoon he was driven to the steamer plying between Fortress Monroe and Baltimore, continued in charge of a surgeon who had been sent with him from the field. At midnight, while on the Chesapeake, the most profuse secondary hemorrhage came on, which

was controlled, as best it might be, by masses of ice held continuously to the wound. The patient died during the next day at a hospital on the wharf in Baltimore—under what exact circumstances I could not learn; most likely, however, from exhaustion.

Case IX.—J. B., middle-aged man, gash, from a blow, lacerating the cheek, opening the duct of Steno.

Treatment.—With a heavy-eyed needle, carried a loop from the bottom of the wound to the inside of the cheek—the silk, which was very loose, conducted the saliva into the mouth. Brought the external wound together by strips of resin plaster; no other treatment required, save an occasional dressing. In a week the loop had sloughed through into the mouth, preserving completely the track for the secretion, and the process of granulation had advanced almost to the stage of cure in the external wound; no after-trouble.

Case X.—C. A., young gentleman, twenty years of age, deep punctured cut in the floor of the mouth just to left of middle line, made by the slipping of an elevator in the attempt to remove root of upper canine tooth. No hemorrhage, or immediate bad sign of any kind; patient very much frightened. Accident had occurred two days before my seeing the case; part very sore and tender; inflammation limited.

Treatment.—Directed arnica water for relief of the soreness; nothing else indicated or required; the wound healing rapidly and kindly.

Case XI.—Cut received by young lady, exposing and incising mylo-hyoid artery of left side in the groove; hemorrhage very great and persistent.

Treatment.—Upright position; tinct. Erigeron as directed; strong alum solution held to the part on tufts of cotton, afterward thrown with the syringe; ice to the part, etc. No result on the bleeding. The patient becoming affected from loss of blood, enlarged the wound, picked out the vessel with the Liston forceps, and tied it. This, of course, controlled the hemorrhage. Patient recovered.

Case XII.—Mr. C. Performed operation on the cheek for erectile growth; cut well into the sub-tissue, making quite a deep wound, just as if the part had been scooped out.

Treatment.—Cold-water dressing; waiting on nature to fill up wound with granulations; nothing else required, nothing done; the case progressed to a satisfactory cure, excepting a raised scar.

Case XIII.—Young man, shot through the cheek; the mouth

being, at the time, fortunately open, the ball passed out, doing no further damage; no hemorrhage.

Treatment.—Applied cloths wrung out of cold water, for the purpose of controlling vascular reaction; nothing else done; wound suppurated until the compressed and devitalized tissues were sloughed; then kindly granulated, the patient being entirely well in a month.

Case XIV.—Patient, young lady. In an attempt to extract the first molar tooth of right upper jaw a flap of gum had been torn, extending around the mouth to the left second bicuspid; this flap had been hanging loose some three hours before the patient presented herself.

Treatment.—Cut it off, and depended on granulations from the wounded surface for the filling up; patient comfortable next day; entirely well in a week; no other treatment of any kind required.

Case XV.—Boy, twelve years of age; playing with powder contained in a bottle, it unfortunately exploded, throwing the glass and powder into his face. When first seen, an hour after the accident, the patient was in the greatest distress; the eyes were completely closed, lashes entirely destroyed, hair singed, face raw and bleeding, pulse rapid, and very irritable.

Treatment.—First, Seidlitz powder, with half grain of opium; second, removal of such pieces of glass as could be readily picked away with the forceps; third, cold-water dressing. In an hour the patient was fairly comfortable; at the end of which time a second half grain of opium was administered.

Second day. Face very sore, but no burning pain; picked away several small pieces of glass and a number of powder grains. Continued cold-water dressing.

Third day. Reactive inflammation evidently aborted; water dressings dispensed with; used in place

℞.—Ol. lin.
Aqua calcis, āā q. s.

With this the surface was protected from the atmosphere until it cicatrized—a period of two weeks. During the time of cure some little attention was given to the diet, the patient for the first day craving principally ice-cream, which answered very well, and served to allay a slight tendency to irritative fever which existed—the latter four days of the first week stimulating articles of food were interdicted; after this he ate what he best liked.

Case XVI.—Patient, young gentleman. Struck, while on a gunning excursion, by a buckshot, which passed through the lower lip, burying itself in the bone. Patient not seen until the next day; lip too much swollen to permit of examination.

Treatment.—Cold-water dressing to the lip. Mag. sulph. ℥ss internally.

Third day. No diminution in swelling; slight erysipelatous blush; brushed the parts with the following combination:

R.—Tinct. ferri chl. ℥ss;
Quinia sulph. gr. xxx;
Tinct. cinch. gtt. x;
Aqua, ℥iv. M.

In one hour the blush disappeared—water reapplied.

Fourth day. Inflammation, with the swelling, disappearing very rapidly; water-dressing continued.

Sixth day. Probed the wound; discovered the shot lying near the root of the first bicuspid tooth; dissected away the gum from the inside, and with a very small curved gouge picked the lead away.

Seventh day. Inflammation back again, confined, however, rather to the inside of the mouth; reapplied the cold-water dressing, and directed a Seidlitz powder.

Eighth day. Better; inflammation rapidly yielding; a little pus escaping from the shot track in the bone.

Tenth to thirteenth day. Track of wound in the bone suppurating considerably; tinct. iodine injected.

Fourteenth day. Discharge diminishing; iodine still continued.

Sixteenth day. Discharge entirely ceased; patient dismissed.

Case XVII.—Patrick T., laborer. While engaged in blasting rocks the patient was struck with great force, just below the orbit, by a flying fragment, lacerating, in a frightful manner, the soft parts of the face, breaking and knocking into the nares the left nasal bone, and severely concussing the maxillary. No hemorrhage; heavy shock.

Treatment.—The patient being a strong, plethoric man, reaction was allowed to establish itself, and which it did completely only after the lapse of several hours. Cold-water dressings were, however, at once applied to the parts, every deduction being in favor of the inference of severe inflammation. The accident occurred in the morning. At seven in the evening, a pine stick, whittled, to make its introduction easy, was coated over the end by dipping it in

melted wax, and with this, insinuated into the nostril beneath the depressed nasal bone, it was thrust out into place, position being maintained by a tuft of wax-coated cotton, having attached to it a string for its withdrawal, being pushed up beneath the fracture.

Examination of the injured face and maxillary bone revealed contusion and injury to such an extent as to make it plainly evident that the process of cure must be that of exfoliation, sloughing, and repair by granulation; the only treatment was then the expectant, and this was met by a simple water-dressing.

Second day. Most decided reaction. Mag. sulph. ℥ss administered in half a glass of water; water-dressing, medicated with lead and laudanum.

R.—Plumbi acet. ℥ij;
Tinct. opii, ℥ij;
Aqua, ℥xxx. M.

Cloths wet with this lotion kept constantly upon the cheek.

Third day. Inflammation abating, but patient complaining of feeling hot and generally miserable. Lemonade ordered as a febrifuge, to be made by expressing the juice of an ordinary lemon into a goblet, sweetening, and filling up the glass with ice broken into a coarse powder. To be allowed ad libitum.

Fifth day. Wound suppurating; fever all gone; dressing changed to simple water; waxed cotton changed in nostril,—the replacement giving much pain.

From fifth to tenth day. Water-dressing continued; portion of external plate of the bone apparently dying; periosteum evidently destroyed.

Eleventh day. Stimulation commenced; parts wet three or four times a day with the following:

R.—Alum pulv. ℥ij;
Tinct. capsicum comp. ℥ss;
Aqua, ℥xvi. M.

Fifteenth day. Granulations being thrown out from around the edges of the wound; parts brought as closely together as possible, and retained with adhesive strips; nasal fracture doing very well.

Twenty-fifth day. Wound of face entirely healed, with the exception of a small place in the center, which, when examined with the probe, discovered a sinus leading to diseased bone.

Thirty-fourth day Piece of bone presenting at the sinus; enlarged the opening, and withdrew a sequestrum rather larger than an

ordinary finger-nail. Examination with the probe, after the removal, gave the fleshy feel indicative of repair. Case dismissed on the thirty-sixth day.

Case XVIII.—Young man, struck on the side of the face, in a street brawl, with a slung-shot; face severely cut and contused; outer boundary of the antrum driven backward into the cavity, not fractured apparently, but simply bent inward.

Treatment.—Cold-water dressing,—no other application for the first three days. After this, the patient being compelled to go out to his work, adhesive strips were employed; repair progressed rapidly, without a single adverse manifestation. The depressed plate of the sinus gave no trouble, soon accommodating itself to its new position; all sense of soreness leaving it by the end of the second week. External wound cicatrized in twenty days.

Case XIX.—A young man slipped while standing on a stall in a market-house; falling forward and downward upon one of the hooks, it entered his mouth, breaking off three of his upper teeth, perforated his hard palate, and passed by its point into the right nostril.

Treatment.—Seen first one hour after the accident. Pain in the broken teeth unbearably severe. Examination discovered the engorged pulps entirely uncapped and bulging from their cavities. The probe introduced through the wound in the palate passed readily into the nares, giving little or no pain. No fracture of the bone, save a few trifling spiculæ about the circumference of the puncture. The roots of the broken teeth were at once extracted, and the case, for the time, left to nature.

Second day. No necessity for any interference; some soreness, but no actual pain.

Third day. Nothing required to be done.

Fourth day. Three trifling pieces of bone discharged into the mouth.

Seventh day. Wound granulating very satisfactorily.

Fifteenth day. Nature unable, evidently, to quite fill up the opening; assisted by scarifying the circumference of the wound, and touching with tincture of iodine.

Seventeenth, twentieth, and twenty-second days. Scarified, and touched with iodine.

Twenty-fourth day. Opening completely closed. Case dismissed.

Case XX.—Gentleman. While striking the iron handle of a chisel in the act of opening a box, a small piece flew off from the hammer, burying itself in the malar process of superior maxillary bone.

Treatment.—With probe, searched in the wound for the foreign body; found it in position as described, with very oblique track through soft parts. Introduced a sharp steel instrument, and, after some trouble, succeeded in working the piece loose; could not, however, get hold of it with forceps without such manipulation as would evidently enough contuse the parts. Introduced a director down to the body, and cut to it; removed it in this way without effort. Wound closed with two delicate sutures, and the cold-water dressing applied; in three or four days the parts were entirely well, without the slightest suppuration having occurred,—no noticeable scar being left.

CHAPTER XXXII.

OZÆNA.

The term ozæna, like the term epulis, is a somewhat indefinite one, and is to be first considered in the width of its signification.

Ozæna is from the Greek ὀζη, signifying stench, and the term is, therefore, in reality and strict justice, applicable to any ill-smelling condition. By universal consent, however, it has been restricted in its application to foul conditions about the nares and associate parts, accompanied with offensive discharge. The study of ozæna, then, it will be seen, is the study of various conditions, and may be considered under the following heads:

1. Accumulation and degeneration of the common antral secretion.
2. Degenerated pus from tooth-abscess discharging into the antrum.
3. Ulceration of mucous membrane of the antrum.
4. Deteriorated secretions from constitutional causes.
5. Caries of the osseous walls of antrum of the nares.
6. Ulceration of the mucous membrane of the nares.
7. Caries and necrosis of the osseous boundaries of the nares.
8. Lodgment and retention of foreign bodies.

The first of these conditions is most frequently observed in connection with the ordinary cold in the head. The outlet of the antrum, it will be remembered, is by an opening about the size of a goose-quill into the middle meatus, which opening is circumscribed by mucous membrane, and which membrane, as the result of congestion, can very well occlude this outlet; the parts being in this condition, it may happen that the pent-up mucus degenerates and decomposes, so that, on the subsidence of the swelling, the escaping discharges present this offensive odor. To diagnose this character of ozæna, it is only necessary to connect it with the preceding inflammation, with the absence of specific conditions, and with the readiness with which it yields to simple treatment. Of course there would have been a preliminary feeling of the sense of congestion on the part of the patient; he would have had, to express

it most simply, a cold in the head, and this cold, with its sense of dryness and constriction, would have grown worse, until, with the appearance of the discharge, he would have experienced a sense of relief; the discharge implying the passing away of the congestion and the restoration of the normal circulation and secretion.

To cure this form of ozæna requires very little treatment,—indeed in many cases no treatment at all. I am in the habit, when the discharge continues longer than two or three days, of directing the sniffing up the nostril of the affected side some such combination as the following:

℞.—Æth. sulph. ℥i;
Tinct. iodinii, ℥ij;
Ol. juniper. ℥i. M.

If this fails to check the discharge, I then employ such constitutional treatment as seems indicated. Patients in whom such discharge exists belong to one of two classes, the plethoric or anæmic. With the first, the treatment demanded is depletory: a dose or two of sulphate of magnesia will generally be all that is demanded; although in a few instances I have found it necessary to deplete from the veins. With the second class—and this is by far the most numerous—we have the mucous membrane of the part falling into a condition analogous to the urethritis of chronic gonorrhœa: in these cases tonics are at once to be resorted to, and the common combination of iron and quinia is perhaps about the best that can be prescribed:

℞.—Tinct. ferri chl. ℥i;
Quiniæ sulph. ℥i. M.
Sig. 15 drops in water every three hours.

2. Fetid discharges depending on tooth-abscesses—abscesses which discharge into the antrum—find their cure, as a rule, immediately on the extraction of the diseased tooth. If this should not, however, prove to be the case, then injections are to be made through the tooth alveolus. Iodine is an admirable base for all such injections. My own practice would be first to control the odor with the permanganate of potash.

℞.—Potass. permang. ℥ss to j;
Aqua, ℥viij. M.
Inject *pro re nata.*

It would most likely be quite sufficient to use this injection three times a day—after which the following should be thrown in:

℞.—Tinct. iodinii, ℥i;
Glycerin, ℥i;
Acid. tannicum, ℥ss;
Aqua Cologn. ℥i;
Aqua pura, ℥iij. M.

Or,

℞.—Tinct. capsici comp. ℥ss;
Aqua, ℥viij. M.

Or,

Chloroform. ℥i;
Spts. æth. nit. ℥ss;
Spts. vin. ℥iv. M.

Or,

℞.—Argent. nit. grs. xxx;
Aqua, ℥vi. M.

Indeed, any stimulant preparation may be resorted to, although I incline to believe that iodine acts the most happily.

3. Ozæna from ulceration of mucous membrane of the antrum is not, so far as my experience allows me to judge, a condition of frequent occurrence; without doubt this is the case where no specific disease, as syphilis, scrofula, or scurvy, exists, so that, meeting with such ozæna, we naturally at once revert to the constitutional condition. To discover an ulcer within the antrum is a matter for diagnosis by exclusion, and thus to discover it is not at all a difficult matter. If there are no diseased teeth or teeth roots; no nasal ulceration, no antral dropsy, no acute preliminary conditions; if the fetid matter flows most freely when the suspected antrum overlies its nasal outlet, then we will generally be right in inferring an ulcer of the antrum; but an ulcer in the antrum is not necessarily a cause of ozæna. To give this fetid odor, it must be an unhealthy ulcer, by which is meant that it tends to degenerate its granulations, rather than to organize them. An ulcer, says Mr. Cooper, may be defined to be "a granulating surface, secreting matter;" and this is certainly true of most ulcers, particularly if we replace the term secreting with the term making; for the matter given off is, I imagine, nothing but degenerated lymph-corpuscles, to which the parts lacked strength to give force of organization. A healthy ulcer may be seen in any accidental sore tending to rapid self-cure; there

is here little, or perhaps no matter, for the reason that every particle of the exuded lymph of repair has in it vitality sufficient for its organization. An unhealthy ulcer, on the contrary,—and by such an ulcer we mean an adynamic one,—gives off more or less pus; it throws out its reparative lymph just as does the healthy one, but the viability of such lymph differs materially from the exudation of the former ulcer. Thus, according to the nature and character of such degeneration, we have the produced pus: ichorous, a thin, watery, acrid discharge; scrofulous, a cheesy, curd-like pus; sanious, a thin, sizy discharge; glutinous and viscid, as in sordes, etc.

Now, whether any or all these kinds of ulcers should give us the fetor of ozæna, would depend on circumstances; not the least important of which would be the state of the atmosphere, and the cleanliness preserved. Laudable pus, issuing from a healthy wound, will, in hot weather, become in a very short time quite offensive, as is, unfortunately, too freely illustrated in hospital practice. Certain ulcers are, however, in themselves offensive. Every one has had occasion to observe, at some time or other, the disgusting odor arising from the saliva of particular persons. I recall, even to this day, a certain schoolmaster, the odor of whose spittle, employed to rub sums from my slate, always made me sick. This kind of saliva, and this odorous ulcer, belong to the alkaline class of people. Give such persons acid: they always need it; I never knew an exception.

A simple ulcer of the sinus, that is, one not associated with osseous diseases, is to be treated in the twofold direction of its constitutional and local requirements. To treat an ulcer justly, calls for an understanding of the conditions on which ulcers depend; and as ulcers of various signification so frequently present themselves about the mouth and throat, it may not be a digression to make a hasty review of so enlarged and important a subject.

Ulceration is the absorption or the breaking down of some constituent part of the body. Its great cause is inflammation. Inflammation is always preceded and excited by irritation. The term irritation is a comprehensive one, and covers every source of offense to the human body. Thus one man has an ulcer, the result of an inflammation excited and perhaps kept up by the presence of some foreign body, as, for example, a ball, a splinter of wood, a particle of dust, etc. An ulcer, says Richerand, is from a cause inherent in the economy, and differs from a wound, which is always idiopathic, in being symptomatic. A second man has an ulcer, the

result of a localized inflammation, predisposed by the presence within his system of some specific taint. These ulcers, a glance would exhibit, must vary widely in their character, and even more so in the treatment demanded for their cure. Thus it is that we speak of, and think about, ulcers in the way of their signification. We have simple purulent ulcers, venereal ulcers, scrofulous ulcers, scorbutic, varicose, and cancerous ulcers; the character of each being expressed by its adjectival prefix. A simple purulent ulcer is a sore, the result of some local accident, and is, most likely, self-curing; a venereal ulcer is one excited and kept alive by the presence in the system of the venereal poison; the scrofulous, scorbutic, and cancerous alike depend on dyscrasic conditions; the varicose on certain obstructions in the venous system, etc. To secure a cure, in the first of these classes of ulcers, nothing more is necessary than to protect them from adverse influences. A varicose ulcer, to be gotten well, must be converted into a simple one by treatment directed to the trouble in the circulation; a cancerous, scorbutic, or scrofulous ulcer is only to be permanently cured by obliterating the cachexia. There is nothing obscure in the appreciation of these facts; any difficulty is in meeting the indications. Ulcers, it is true, are presented under a great variety of names; but these variations have reference alone to varieties in expression. Thus, the carious ulcer implies that the condition is dependent on the presence of dead or dying bone; a callous ulcer is one having an indurated circumference; a fungous ulcer, one where the granulations of repair are in excess; a sinuous ulcer is one constituting the orifice of a canal leading to a deeper than the manifested disease; an irritable ulcer is one that, from internal or external causes, has become tender and excited; a phagedenic ulcer is one that tends to take on gangrenous action; a sordid ulcer is one discharging a dirty-looking, glutinous matter; and so on, each of the many appellations being simply an expression of some distinctive peculiarity. Now, one man, having syphilis, gets a rheumatism in his joints, another gets an ulcer on his tibia. In these two cases the important features of treatment are, however, to be precisely alike; both patients must have an antisyphilitic medication; the local applications are simply adjuncts. An ulcer simple in its character, situated over or upon some part in frequent motion, is apt to assume the irritable aspect; an ulcer the result of an idiopathic influence, if occurring on a person of weak and typhoid condition, is almost certain to assume the chronic or indolent form; an ulcer engrafted by external cause on a

depraved constitution is always more or less influenced by the vice, and such vice must be considered in its treatment; and so, whatever may be the extent of the review, this wide collateral relationship keeps itself in the foreground.

To return, then, to ulcers in the antrum. We are prepared to recognize that such ulcers may be of various signification, and may, for their cure, demand a various character of treatment. So far as the odor, however, is concerned, all will benefit by the common primary treatment of cleanliness and antiseptic injections. To correct the fetor in a chronic case, it generally becomes a necessity either to trephine through the canine fossa, or to extract one of the underlying teeth and get into the cavity through its alveolus; the latter mode is decidedly to be preferred. A plan, however, that may be tried, consists in keeping a tuft of cotton or fine sponge in the nostril, and frequently saturating it by the sniffing into it of an antiseptic. The entrance into this cavity, however, through the alveolus of a tooth is one of the simplest procedures in surgery, demanding only that the operator shall recognize the position of the cavity as influenced by the shape of the jaw. Any spear-shaped instrument will answer to make the opening; to keep it patulous, it is only necessary to introduce, after each operation of injection, a tent of cotton or sponge. As an injection, the following combination may be employed:

R.—Acidi carbolici, gtt. xx;
Glycerin, ℥ss;
Acid. tannic. gr. v;
Aqua, ℥vi. M.

Or,

R.—Spts. vin. ℥i;
Creasotum, gtt. x;
Aqua, ℥vi. M.

Or, as suggested on page 498, the permanganate of potash in the proportion of from two to ten grains to the ounce of water, as indicated.

Associated with such antiseptic treatment, and which we employ in every case of ozæna, whatever may be its origin, we connect the specific or peculiar treatment demanded by each special case,—the understanding of which treatment presupposes and necessitates the understanding of disease in general, and can conform to no special rules.

It is true that for certain diseases we have certain medicaments which we have come, perhaps unadvisedly, to consider too much in the light of specifics. Thus, in syphilis the mercurials are much depended on; so that, having an ulcer of such origin to treat, a constitutional medicine might be prescribed, as follows:

℞.—Syrup. ferri pyrophos. ℥vi;
Hydrarg. bichl. gr. iv. M.
Sig. A teaspoonful three times a day.

Or,

℞.—Hydrarg. bichl. gr. ij;
Potass. iod. ℥ij;
Fld. ext. sarsaparilla, ℥viij. M.
Sig. A tablespoonful three times a day.

Or,

℞.—Hydrarg. chl. mite, gr. iv;
Sacch. alb. pulv. ℥ss. M.
Divide into eight powders.
Sig. One three times a day, followed, after each eight have been taken, by a Seidlitz powder.

Mercury is to be considered as an active force, striking at the parasite of syphilis, destroying it; and while it is very well thus to kill such parasites, it is quite as well to remember that the harm of the agent employed must be constantly met and counterbalanced; this we do by keeping up and supporting the system, so that I think it will commonly be found that syphilitic ulcers require wholesome food, fresh air, proper exercise, judicious bathing,—in short, the employment of every means that tends to the maintenance of the general health.

In the mercurial ulcer—which is far more common than the syphilitic, granting the true syphilitic to exist—the general and local use of the chlorate of potash is found to act very well. The medicine, dissolved in water, may be given in doses of ten grains, repeated four or five times a day; the injection should be not less in strength than a saturated solution. The character of a mercurial ulcer is discovered by associating the local lesion with the existing general dyscrasias.

Scrofulous ulcers are judged by the appearance of the sore, the nature of the discharge, and the existence of the disease in the patient at large. A scrofulous subject, while not always bearing the clearest general evidences of the disease, yet generally has some one

or more features that will allow us to distinguish the condition. General features associated with scrofula may be enumerated as follows. The first manifestation occurs generally, not always, at the period of first dentition, the symptoms being irregular appetite, an ill-smelling, inspissated mucus, swelling of the superficial glands of the neck. Continued manifestations advance with age, presenting subcutaneous lymph effusion, particularly about the calves of the legs and the outside of the thighs; various eruptions, inflammation, and suppuration of joints, especially the hip, knee, and thumb joints; a flaccid, enlarged condition of the tonsil glands, susceptibility to atmospheric changes, inability to endure physical fatigue, impoverishment of the blood, general asthenia. Scrofulous subjects are generally languid in their movements, and without impressibility; not always, however, for it is a well-known fact that many of the most precocious and bright persons end their effulgence in phthisis. In short, the history of scrofula is the history of phthisis; it matters little, so far as a general effect upon an individual is concerned, whether the tubercle deposits itself in the lung or in the ganglia, or diffuses itself over the system at large.

Scrofulous ulcers are always unhealthy in appearance, being covered with a dirty yellowish aplastic matter, irregular about their edges, generally bluish or purple, more or less undermined, and discharging an ichorous, flaky pus; local stimulation meets with little or no response, and, for the reason of the general deficiency in vitality, the parts around are usually indurated from interstitial deposits, chronically congested, and looking altogether indolent and ill-conditioned.

The treatment of scrofulous ulceration is (in our present knowledge of the disease) simply a treatment of building up. Unacquainted with the character and causes of the diseases, we direct our aim to so lift up the life-forces that a sufficient inherent vitality may be developed to throw off or overmaster the depressing influence. Exercise, tonic medicaments, cold bathing, salt and mountain air, rare or raw meats, generous liquors, all are useful means to such an end. Iodide of potassium has long had a reputation in this disease, also barium, iodide of iron, syrup of the phosphates, cod-liver oil, phosphoric acid, etc. My own individual opinion and experience is, that wrapping one's self in a wet sheet on getting out of bed, and securing vigorous reaction by a good hand-rubbing, and, after such operation, drinking the yolk of a fresh egg drowned in good brandy or whisky, is better than any medicine proper yet prescribed. Certain I am

that I have seen this treatment do such good as warrants the commendation these remarks would give it.

We always, however, do something to a local disease, if for no other reason, from mere force of habit. We can use with these ulcers any of the applications referred to a few pages back, and any one of them is about as good as the other, or we may use them one after the other.

Syphilitic ozæna from ulceration of the antral mucous membrane must be, as remarked, an exceedingly infrequent affection. Not so, however, with ulceration from such cause in the nares; such a condition is quite common. When you have a case in which dirty clotty scabs are constantly being received into the handkerchief, and much offensive sanies is discharged from the nose, you may feel well satisfied that you have a case of syphilitic ulceration, and particularly may you rest satisfied in your diagnosis if any evidences of the disease exist in other parts of the body. Syphilitic ulceration of the nose has frequently been confounded with a commencing polypus; but the conditions are so dissimilar that only the most culpable carelessness could fail to distinguish them. In the first condition there are the fetid discharge, and the association with the anterior train of accidents; a scab soon comes away, and a temporary cessation of the obstruction ensues In the latter disease the obstruction is gradual and continuous; there are no fetid clots, and no anterior accidents of association: blowing the nose, in the one case, most likely relieves for the moment; in the second, it throws forward the polypus so that we can see and feel it.

Syphilitic ulcers within the nose attack equally any location, and possess the most unfortunate tendency to enlarge and burrow, so that, if not successfully combated, in a very short time the bony framework is involved, thus giving the deformities so common.

A patient with a syphilitic ulcer developing in his nose, complains first of a feeling of congestion. We come to our conclusions because we observe other certain secondary indications. A few days, more or less, pass, and he is troubled with a discharge; this, at first, is very little or perhaps not at all offensive. Very soon, however, he remarks the odor, and the discharge, which continues to increase, frequently becomes so profuse that twenty or thirty pocket-handkerchiefs are necessary for his daily use. Occasionally, and sometimes very frequently, dirty, gluey clots or scabs come away, and the ulcer, if seen, is noticed to present a reasonably healthy

look, something, for example, as a chancre would look when only half destroyed and casting off its slough. If uncombated and unconquered, the ulcer eats deeper and deeper, until the bone is reached, which, in its turn, succumbs, giving us caries, or, much more likely, necrosis. Arrived at this stage, we have, indeed, a most formidable condition, and it is not at all unlikely that, in defiance of every effort, more or less deformity will result.

An ulcer situated in the anterior part of the nares is indicated by the forced expirations of the patent. Situated well back, he relieves himself by forced inspirations; occasionally, however, from the very beginning the pituitary membrane becomes so thickened and engorged that the passage of air through the tube is almost shut off: in these cases the trouble is indicated by excessive restlessness.

It is not by any means always the case that nasal ostitis is secondary to ulceration: on the contrary, the cases are frequent enough where the bone becomes primarily diseased and where the ulcer is simply the associated lesion. Syphilitic ostitis very frequently ends in necrosis; and more particularly is this the case where the turbinated bones are the ones affected. The vomer, however, is the one most frequently necrosed in syphilis,—that is to say, the most frequently attacked; and this is brought about in three ways: first, from a primary ulceration of its mucous covering; second, by the deposition of submucous tubercles; third, by the direct affection of the bone. When ostitis attacks the vomer or any other bone, our best efforts are to be directed to the resolution of the inflammation. To secure this end, we resort to such local means as seem indicated by the peculiar features of the case. The treatment would be that applicable to inflammation anywhere; it could be influenced by the temperament of the patient and the stage of the disease; locally we have nothing at this time to do with its specific character; we have simply to treat a perverted condition of the circulation of the part. Constitutionally, however, its origin is to attract our closest scrutiny; and, in connection with the local remedies employed, antivenereals must be depended upon as our strongest supports.

The diagnosis of inflammation of the nasal boundaries is not difficult to make out. When the vomer is the bone attacked, the patient suffers from sharp pains, referred to the root of the nose; he has headache, always increased by the recumbent position. If the inflammation exists in the anterior part, pressure on the cartilage increases the pain.

The nasal bones, when affected, exhibit an overlying congested skin; pressure on the bridge is responded to by much pain; the lachrymal secretions are affected, and not unfrequently, because of the congestion in the ductus ad nasum, run over the cheek. The turbinated bones, when the seat of the inflammation, yield a soreness to the lateral aspects of the canal, and respond quickly to pressure thereon exerted.

Whichever of these bones may be the one affected, its history, so far as ozæna is concerned, is the same in signification. If the inflammation is not arrested, necrosis or caries, partial or complete, results. Soon a discharge makes its appearance, disgustingly foul if the case is one of necrosis, and more or less offensive, and mixed with osseous particles, if it is caries.

Antivenereal treatment is a treatment of building up. You cannot hope to arrest syphilis when it has passed to its tertiary manifestations in any other way. Limit and circumscribe the local inflammation as much as you can; and to do this you will generally find that stimulants act a better part than depressants. An excellent injection is a combination of iron, iodine, quinine, and glycerin.

℞.—Tinct. ferri chl. ℥i;
Quiniæ sulph. gr. xxv;
Tinct. iodinii,
Glycerin, āā ℥i;
Aqua, ℥iv. M.

Sig. Inject, or brush over and about the parts, three times a day.

Give iron and quinia internally: it is scarcely probable that a patient having syphilitic necrosis needs a mercurial course; indeed, it is much more likely that he has already been so overdrugged with this medicine that his trouble is mercurio-syphilitic, rather than syphilitic alone. Iodide of potassium is recommended and freely prescribed in these tertiary conditions: it may be given in doses of from ten to twenty grains dissolved in water or in the fluid extract of sarsaparilla. But good rare roast beef, poultry, a daily glass of malt liquor, boat-rowing, wrestling, horseback-riding, systematic bathing, these are the reliable medicines, and may elevate the vital forces to an ability *per vias naturales* to throw off the disease. It is confessedly hard to cure syphilis when it has thus taken hold of the system; and when it inflames a bone, particularly a small one, the patient is lucky if he escape without its complete destruction.

Necrosis, partial or complete, implies, of course, the existence of a sequestrum; and the getting away of this dead part implies very generally the cure of the ozæna. Particularly is this the case when the death is limited to the single bone or piece. To get away this piece is then one of the most important features in the treatment. How is it to be done? Simply wait until the probe reveals that it is loose; if it may not be taken away through the orifice of the sinus it has itself created, we have only to enlarge in any convenient way such sinus, and then lift the piece away. If, after the removal of such dead bone, we find the discharge continuing, but modified as to character and odor, we infer the necessity for stimulation, and use the iodine, or iodine and iron, or the combination with tannin and glycerin, as seems to be indicated. It might be, however, that neither the discharge nor the odor decreased: in such cases we are seldom wrong in inferring that more dead or dying bone is in the wound, and the treatment first employed is to be renewed. When tertiary syphilis has associated with it severe nocturnal pains, great relief is frequently secured from the administration of the iodide of potassium, particularly if combined with minute doses of phosphorus—say five drops of the acid. phosphoric. dilut.; as a dose it is to be remembered, however, that, because of the relationship of the potash with the mucous membranes, in many persons even very small doses will excite much irritability in the air-passages, thus seeming to increase instead of allaying the trouble. With such patients we must diminish the dose of the iodide *pro re nata.*

Bromide of potassium is now frequently employed to procure rest and tranquillity. It is commonly prescribed in doses of ten grains; but forty or fifty will be found the better dose. It is best given in a little water just as the patient is about to get into bed.

Lodgment and Retention of Foreign Bodies.—In the use of cotton or sponge about the nares, care is to be taken that the pellets do not escape attention and remain lodged in the passages. Some of the most offensive and resisting discharges occasionally have their cause in this direction. Rhinolites—calculi varying in size from a pea to that of a pigeon's egg—sometimes form in the canals, and, by inducing ulceration and collecting debris, become the source of ozæna. Peas, rags, buttons, and sundry other articles are not unfrequently found in the nares, thrust there by children of experimental proclivities, any of which may, of course, become a source of offense.

The removal of foreign bodies from the nares is always to be effected as speedily and with as little injury to the parts as possible. A plan that may first be tried is to place the patient in a strong light and search the parts with very delicate forceps: if the body can be seen, it may thus generally be removed. Another plan consists in giving a pinch of snuff and compressing the unobstructed nostril: the effort of sneezing will not unfrequently throw the body a considerable distance. Still another plan is to compress the unobstructed nostril and blow into the mouth, thus forcing it out. An annealed wire, bent into the form of a loop and passed over the body, is very frequently employed with satisfactory success; a flexible, blunt, double hook is also used with advantage. The syringe is sometimes found beneficial, the obstruction being washed back into the throat.

CHAPTER XXXIII.

FRACTURES OF THE MAXILLARY BONES.

Fractures of the maxillary bones may be divided into two classes, simple and complicated. The first applies to such cases as are without external or associate injury, implying a simple break in the continuity of the bone. The second applies to cases associated with comminution of the bone, to external lesions, injury to vessels, to teeth,—in short, any and every condition which alters the fracture from that of a simple to one of a compound character.

The inferior maxilla, from the exposure of its position, from its shape, and from its office, is much more liable to the accident of fracture than either of the superior—the accident being commonly the result of blows, falls, kicks, etc. These fractures will, in the majority of cases, outside of gunshot injuries, be found associated with the body of the bone, the rami escaping, from the fact that a force brought to bear upon them slips the articulation easier than it may break the bone.

The weakest part of a bone would most naturally be the part to yield in a diffused blow. In most inferior maxillæ this weakest point is found to be the line of the roots of the canine teeth; hence the most frequent seat of fracture in the bone is in this line, either to the right or left, as influenced by the direction of the force. This, however, as would be inferred, applies to an unbroken dental arch; when teeth have been lost, and the process removed, the situation of this weakest part is materially altered. In gunshot injuries, accidents from the passage of a wheel over the jaw, or similar applications of force, fractures occur, of course, at the seat of such applications, and follow no rule. In the work of Prof. Hamilton on Fractures, in twenty-four recorded cases of breaks in the inferior maxillary bone, one was perpendicular through the symphysis, twelve were through the body, five through the angle. Of the twenty-four, eleven were of a double or triple character, the direction of the fracture being mostly oblique, both as direction is concerned, and the face of the break.

It is singularly the case that most fractures of the body of the lower jaw are compound, the opening existing on the lingual aspect; this seems to be the result of the easy lacerability of the gum tissue, combined with the quick displacement inward of the fractured part. This exposure of the bone seems, in many mouths, to be of no very material consequence. In others, however, it is quite the reverse, the saliva thus allowed to come in contact with the bone degenerating and deteriorating the tissue.

Fractures from blows of the fist, or similar concentrated forces, are apt to be single; from falls, they are apt to be multiple; from kicks of animals, comminuted. A common cause of fracture, familiar to every dentist, is found in the extraction of teeth having large and bifurcating roots; luckily, however, such fractures are not of a serious nature, generally being confined to the alveolar process, although cases are on record where such accidents have been so extensive and severe as to cost the life of the patient. Complete division in the continuity is, however, rare, very few cases having occurred.

The symptoms denotive of a fracture are seldom or never obscure. There are, first, the mobility at the break, and the crepitation; second, when the break exists in the body, there is the loss of harmony in the line of the teeth, the short fragment being pulled upward. If the fracture be multiple, irregularities will be produced in the line of the arch, and in the articulation. If the freed portion be the anterior or chin part, it will be dragged downward and backward by the action of the genio-hyoid, hyoglossus, and digastric muscles. If it be at the line of the cuspid tooth and at the upper portion of the ramus, the fragment will be displaced inward by the action of the mylo-hyoideus, upward by the action of the masseteric, and forward by the action of the pterygoidei. If the fracture be single, and beneath the attachment of the masseter, crepitation will be present, but little displacement. If the neck of the bone is broken, the body is dragged forward by the action of the pterygoid, crepitation and mobility will be very apparent, and much pain will attend the movements of the jaw, produced by the displacing action of the temporalis.

Pain, soreness, inability to masticate, inflammatory phenomena, impediment to speaking or swallowing associate with and characterize the accident,—in short, the history of a fractured jaw is the history of a fracture anywhere else, allowing for differences in office.

Fractures of the superior maxilla are quite infrequent, and when they occur, except from extraordinary causes, demand little attention outside of that which pertains to the injury as a contusion. Of such

fractures I have treated a number which surprises me, considering the rarity of the accident; but in no instance, outside of the alveolar fractures, have I met with a displacement which required apparatus for its cure. Indeed, the cellular character of these bones, and the existence of the antra, permit of such yielding that depression of the substance of the bone commonly forms the displacement; hence the associated frequency of caries with such accidents, the vitality of the part being lowered or destroyed. It is not, however, to be understood that displacements do not occur; the force of an injury may be great enough, as cases are on record to show, to displace the bones in mass. In Mr. Heath's work is the record of a case taken from the Chirurgical Treatise of Richard Wiseman, which is a marked example of such displacement. The patient was a lad eight years old, who had received a blow on the middle of the face so severe that he appeared at first to be dead, and afterwards lay in prolonged coma. "When," says Mr. Wiseman, "I first saw the boy, he presented a strange aspect, having his face driven in, his lower jaw projecting forward. I knew not where to find any purchase, or how to make any extension. But after a time he became sensible, and was persuaded to open his mouth. I saw then that the bones of the palate were driven so far back that it was impossible to pass my fingers behind them, as I had intended; and the extension could be made in no other way. I extemporized an instrument curved at its extremity, which I engaged behind the palate, and, having carried it a little upward, used it to draw the bone forward, which I did without any difficulty; but I had hardly withdrawn the instrument when the fractured portions went back again. I then contented myself with dressing the face with an astringent cerate. I likewise prescribed bleeding, and some hours afterwards I had an instrument better constructed to reduce the large mass of displaced bone to its proper position. I had it held by the child's hand, by that of its mother or of an assistant, each for a certain time. Nothing else was done. Thus, by our united attention, the tonicity of the parts was maintained, the callus was developed, and in proportion as it became solidified the parts became stronger, the face assumed a good appearance,—certainly better than could have been hoped for after such marked displacement,—and the child was entirely cured."

A cast in the Westminster Hospital is also alluded to of a frightful deformity produced by the passage of a wagon-wheel over the face of a man who fell in the street. "Here the bones were completely shattered, and the maxillæ were torn from one another, and

death was instantaneous." A case is also recorded admitted into the same hospital in 1860, resulting from the overturning of a cab upon the face of its occupant, who at the moment was leaning out of the window to direct the driver. Here, in addition to a fracture of the lower jaw, a little to the left of the median line, the nasal bones were broken, both malars were loose and separated from their attachments, and the left bone was fractured, as also the external angular process of the frontal bone. Though not positively ascertained, the vomer was no doubt fractured, and probably the vertical plate of the ethmoid too. The case is reported by Dr. Fyfes in the Lancet, July 18th, 1860. "It was remarkable," says this gentleman, "to observe how movable the bones of the face were. On watching the profile of the patient while he was in the act of swallowing food, the whole of the bones of the face were observed to move up and down upon the fixed part of the skull, as the different parts were brought into motion. It appeared as if the integuments only retained them in their position. It was a curious feature in the case, that notwithstanding the very extensive injury done, and the violent character of the force which caused them, not a single tooth was fractured or misplaced." This patient is reported as having made a perfect recovery.

Of gunshot injuries I have had an opportunity to see some marked examples. In comminuted fractures it has been my practice to pick away such pieces as were completely detached, but to leave and mould, when feasible, all others in place. I never met with trouble from uncontrollable hemorrhage, and generally found the reparative energy sufficient to unite the comminuted parts. In Circular No. VI. of the Surgeon-General's Department, however, secondary hemorrhage is noted as the principal source of fatality in the reported cases: 1579 cases of fractures of the facial bones are reported; and of these 891 recovered, 171 died—the terminations of 517 cases being left still unaccounted for.

The following extract, copied from Mr. Heath's Essay, is from the Official Medical and Surgical History of the British Army in the Crimea: "Wounds of the face," says the report, "though presenting often a frightful amount of deformity, are not generally of so serious a nature as their first appearance might lead the uninitiated to expect. The reason for this, apart from the fact that the face contains no vital organ, seems obviously to be the very free supply of blood the part receives. From this cause, the fleshy structures readily heal, and even the bones are so supplied that extensive necrosis

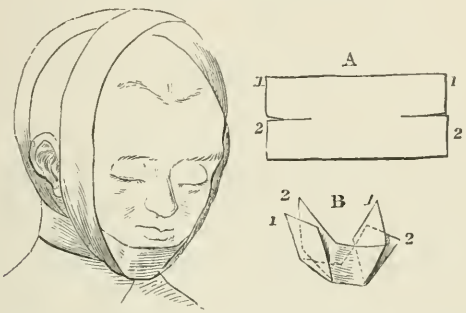
rarely happens. The bony tissues, also, are softer than the long bones of the extremities; and we therefore here but seldom meet with long fissures and extensive necrosis as a result of concussion of bone so often seen in them. This leads us to the very important practical inference, not in this situation, as a rule, to remove bony fragments unless the comminution be great, or the fragments completely detached from the soft parts. Even partially detached teeth will often be found not to have lost their vitality, and, if carefully readjusted, will become useful. There is, indeed, no great object, beyond perhaps the present comfort of the patient, to be attained in removing either fragments of bone or loosened teeth in the great majority of instances. If they die they become loose, and are readily lifted away, without trouble to the surgeon, and but little pain to the patient. This observation is especially applicable to fractures of the lower jaw. Surgeons in this war have seen so many cases of badly fractured instances of this kind unite, and that with a very small amount of deformity, that men of experience are now excessively chary of removing any portion of this bone unless it has become dead, or the fragment is so situated as to interfere considerably with the adjustment of the remainder, or the bone so much comminuted as to give no probable hope of its becoming consolidated, or so sharply angular as to threaten further injury to the soft parts or to interfere materially with their adjustment and retention in situ. In these fractures of the lower jaw, much less support and adjustment than we are in the habit of thinking advantageous in ordinary cases of fracture of it, will frequently be found necessary, or even admissible. A complicated apparatus cannot be borne at first, on account of the condition of the soft parts, and a slight support by a gutta-percha or Startin's wire splint, and a split bandage, is all that can be done. Any attempt at ligaturing the teeth is very generally not only useless, but injurious; and it is surprising how the parts often, as it were, adjust themselves, with but little aid from the surgeon."

The treatment of a fractured jaw involves the indications to be met, and the mode or modes of meeting them. These indications and modes must of course vary with almost every individual case. For a simple fracture of the inferior maxillary, or, indeed, as well for compound fractures, the common pasteboard or gutta-percha splint will generally be found sufficient and reasonably satisfactory. To make this splint, take a piece of binder's board, or gutta-percha, and cut it as designated in Fig. 93.

The board thus cut is soaked in hot water until it becomes suf-

ficiently softened. The fracture is then set, and the splint moulded into shape and position. To do this, it is only necessary to lay the center of the board beneath the chin, one-half projecting; the wings are now brought up and moulded to the cheeks; next take the projecting portion and mould it around the chin and sides of the face. This makes a complete cap, accurately fitting the parts, and when dry, is uniform and unyielding. To hold it in position, a bandage must be applied; the most simple is a modification of Barton's, which suggested itself to me some five or six years back, and which I have since used with much satisfaction. The Barton bandage, so gen-

FIG. 93.—BARTON'S BANDAGE.



A. Shape of the piece of gutta-percha for the chin. B. The same moulded to the part —the ends, 1, 1, being turned upward, and the sides, 2, 2, turned from before backward.

erally employed in fractures of the lower jaw, consists of a roller eight yards in length and from one and a half to two inches in width—following in this latter respect the taste and idea of the operator. To apply this bandage, place the initial extremity behind the left ear; carry it around the side of the head, over the right parietal bone; cross to the right over the neighborhood of the fronto-parietal suture; carry down beneath the chin; carry up on the opposite side; cross on the forehead; carry around the left parietal bone, and meet the beginning of the roller at the occipital prominence, or a little below it; continue the turns until the bandage is exhausted.

Gibson's bandage, used in the same and similar fractures, mostly employed when the break occurs at the angle, consists of three distinct turns. First. Place the initial extremity in front of the ear; carry down beneath the chin; pass up on opposite side, and meet the initial by passing over the fronto-parietal region far enough back to

prevent slipping; repeat this turn three times. Second. Reverse in front of and a little above the ear, and make three turns around the

Fig. 94.—Gibson's Bandage.

circumference of the vault. Third. End the third of these last turns at the occiput, and carry three times around the occipito-mental circumference. This is also an eight-yard roller.

The modification of the Barton bandage, which I find to answer every purpose in my own practice, and which possesses the virtues of ease in application, removal, loosening and tightening, is applied as follows: Take a strip of roller material, one and one-half or two inches wide, one and one-half yards in length. Standing behind the patient, rest the chin on the center of this strip; carry the ends up, cross on the forehead, carry around the sides of the cranium, cross again at the occiput; carry now forward, and tie, or otherwise fix in front of the chin.

In the application of this dressing or strip, if the parts about the jaws are tender, it is better to make the termination somewhere on the side of the cranium. To effect this, it is only necessary to place the chin, when first resting the strip, nearer to one or the other of its ends. The character of this bandage is shown in Fig. 95.

A second method of dressing a simple fracture, one which allows the mouth to be partially open, consists in making two plates, one to fit the upper teeth, in part, and the roof of the mouth, the other to cap a certain convenient number of the lower teeth. After setting the fracture, these plates are put in position, and attached to each other by means of a piece of wax; the attached plates are now removed from the mouth and soldered together. This done, the piece is replaced, and the teeth are closed into the metal sockets; the yard bandage is next applied, and the dressing is completed. This mode

of treating a fracture of the lower jaw I thought original with myself, but have found it employed by Mr. Liston, of England, some

Fig. 95.—The Yard Bandage.

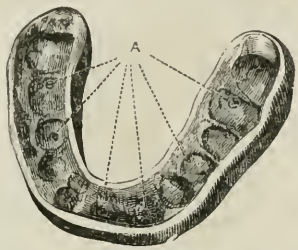
twenty years or more back, the splint having been constructed by Mr. Nasmyth at least five years before the idea suggested itself to my mind.

In any ordinary fracture of the lower jaw, the mode of dressing described will be found to meet all indications. In complicated injuries, it has been the common experience that rules are of little or no consequence; the surgeon will find himself governed and directed by the peculiarities of each case, and will be thrown entirely upon his own judgment and ingenuity. Perhaps no better exemplification of this fact exists than was exhibited in the practice of Dr. T. B. Gunning, of New York, in the case of Secretary Seward. The ideas of Dr. Gunning are multitudinous in this direction; and while his professional sense has prompted him to the fullest exhibit of every means he has employed, yet I am well satisfied, from what I know of the profession at large, that the arrangements are too complex to come into general use. The monograph published by this gentleman should, however, be in the hands of every surgeon. I know of no one who seems to have studied the subject with more care or who has brought to it a more practiced and matured judgment.

Fig. 96 represents the inner surface of a very simple splint used by Dr. G., which incloses all the teeth and part of the gum of the lower jaw. This splint, as will be seen, would be very applicable where there were teeth on either side of the fracture, where there

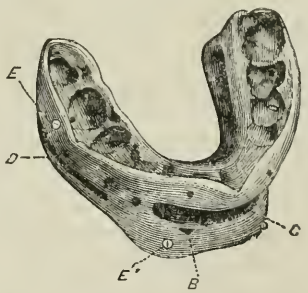
was little tendency to vertical displacement, and where there was an absence of swelling and undue tenderness. The holes marked A are

Fig. 96.—One of Dr. Gunning's Splints.



for purposes of cleanliness, being large enough to receive the point of a syringe-nozzle. When in position, the jaws are to be closed, the plate simply resting against the upper jaw or teeth; the strip bandage, as described, may be thrown around the jaw and head. Dr. Gunning uses this splint without fastenings, but not unfrequently finds it necessary to secure it in place by ligatures, and in some instances by screws, which are made to pass into or between the teeth. In cases of much tendency to displacement, Dr. Gunning uses a splint very much like the one which had previously suggested itself to Mr. Nasmyth and afterward to myself,—not so good or convenient, however, I am compelled to think, as it unnecessarily covers too many teeth, and is thus made cumbersome. This second splint is shown in Fig. 97.

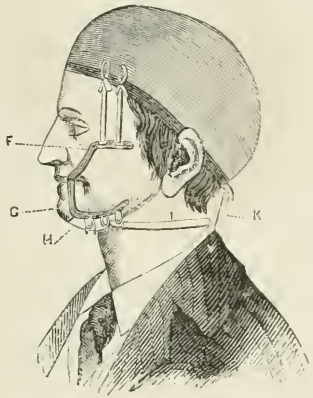
Fig. 97.—Dr. Gunning's Second Splint.



To secure this splint in place, screws are used. C represents an opening left between the conjoined splints, for food, speech, etc.; D, a channel for the saliva from the parotid gland to enter the mouth. E is a screw used in the retention of the piece.

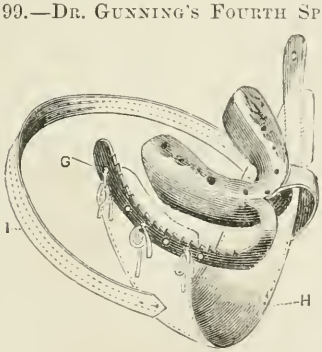
The third modification of Dr. Gunning consists in the attachment to his splint of wings of steel. This is used in cases where the teeth

Fig. 98.—Dr. Gunning's Third Splint.



have been lost in either jaw. F, upper wing; G, lower wing; H, mental band, to hold the jaw up in the splint; I, neck-strap, to keep the band back; K, balance-strap, to hold the cap in place.

Fig. 99.—Dr. Gunning's Fourth Splint.



This is a splint devised by Dr. Gunning to answer general cases. He suggests, first, the moulding of six or eight sizes, to be kept ready for use, from which one is to be selected suitable for any particular case presenting. The wings are of malleable iron, tinned to prevent rusting, and for more ready soldering. These sizes, he thinks, would be sufficient to select from. The splint should have a handle in front, that it may be used as a cup to take the impression of the

jaw, the holes being useful to allow a small probe to be passed through the wax down to the teeth, thus allowing air to enter to facilitate the removal of the impression, and, when in use as a splint, giving entrance to warm water, thrown from a syringe, to keep the parts clean.

The splint should be made to fit well by bending, cutting off the edges, and rounding them up smooth. When a tooth projects so as to keep the splint from fitting, a hole may be cut to let it through, if the metal cannot be hammered out. This should all be done before taking the impression, as a well-fitted cup assists greatly in this important matter.

A splint devised by Dr. Bean, of Georgia, used with decided success during the war of the rebellion, among the Confederate troops, is in its character similar in principle to that of Dr. Gunning. The interdental portion is almost precisely the same. A modification consists in the use of a mental compress. This is simply a "piece of light wood, four and a half inches in length, three-sixteenths of an inch in thickness, and one inch and a half in width in the middle, tapering to seven-eighths of an inch, and round at the ends, to each of which is attached a metallic side piece, four or five inches in length and from three-quarters to one inch in width, also a shallow cup, fitting the apex of the chin. Incasing these side pieces are temporal straps, made of stout cloth, and secured by a strong cord at the base of each piece.

"A bandage, occipito-frontal, is composed of a band passing around the head, from the forehead to the occipital protuberance, and secured by a buckle, one inch to the right of the median line behind, of another strap secured to the band in front and behind, and a third, extending from the temporal buckles on either side and secured to the middle strap at the point of crossing."

It is sometimes the case that from comminution, or other causes, fractures of the inferior maxilla, like fractures of other bones, fail to unite. Necrosis, intervening, frequently prevents such union. To treat these cases, the practitioner will find each to have its special indications. If necrosis exists, the exfoliation of the sequestrum must be awaited. In the few cases where the vital forces seem at fault, they are to be stimulated and elevated. If it occurs that the ends of the fragments have become rounded, and perhaps tipped with cartilage, operative means must of necessity be resorted to,—such means varying with the circumstances. One plan, much approved,

is to pass through the parts a seton, composed of several strands of wire, to be removed strand by strand, as inflammation is to be modified. Or, in place of the wire, other material may be used, as silk, thread, tape, etc. Another operation consists in boring one or more holes through each of the fragments, and tying them together with sutures of wire. Resecting the ends is still another means successfully employed by many. Irritating the ends, and thus provoking the desired inflammatory action, by rubbing the fragments together, is still another plan.

Attention to the circumstances of a patient suffering from ununited fracture is important. A case exhibited several years back, at the clinic of the University of Pennsylvania, by Professor Henry H. Smith, was plainly enough due to the individual having confined himself exclusively to a diet of potatoes, such diet, in this case at least, being insufficient to accomplish the repair. The case of Mr. Seward comes, in many respects, within the category of the ununiting fractures, the means to overcome which constituted the skill employed, the causes here being necrosis and non-fixedness.

Complications, whatever their character, are to be treated on general principles. It is impossible to direct any special course, because of such conditions being constant to no rule. Hemorrhages, so frequently alluded to, I have never met with of any particular moment. When they do occur, however, they are nearly always secondary in character, and it may be well, where possible, to treat them in anticipation: for example, an injury which has lacerated the facial artery would perhaps yield little or no hemorrhage at the time of accident; yet, as the process of sloughing should expose the sound part of the vessel, hemorrhage might be profuse and alarming enough. In these and corresponding cases, circumstances might, in special instances, justify one in searching for the ends of the vessels and ligating them. Injuries to the teeth are to receive due attention: it is not by any means every loosened tooth that is to be removed, or every displaced one that is to be looked on as lost to usefulness. Fractures occurring about the neck of the inferior jaw are to have the displacements corrected by the application of such compresses as are found to answer the purpose, no matter how closely such applications follow any special rules, or how far they depart from them. I do not remember in the course of my professional life ever having treated two fractures precisely alike.

In fractures of the superior jaw, complications are still more anomalous. Thus, I remember being compelled in one case to re-

move the whole alveolar process of both superior maxillæ, the result of a kick received from a mule. In this case the patient was a man broken down by drink and dissipation. I anticipated by compulsion a process which I felt sure would have resulted, but which, to have been accomplished *per vias naturales*, would have cost the patient weeks of suffering, and, not unlikely, life. I have seen a case of fracture of the right upper maxilla, where the alveolar process (the fractured part) hung at least a quarter of an inch below the common level. In this case the part was moulded back into its place and supported by a simple strip passing across the jaw and fixed a little beyond the fronto-parietal suture. In three days the part became self-supporting, and in two weeks the patient was eating solid food.

Gunshot injuries of the face and jaw are of every conceivable variety. The surgeon does primarily, in such cases, all that he can, and rests his hopes on nature.

With Hamilton, we have to remark that it is "impossible to discuss in detail all the varieties of accidents to which the complicated structures of the face are exposed from balls or other missiles."

Certain general rules are, however, to be observed: for instance, as suggested by this surgeon, "Missiles entering and lodging in the face ought to be extracted as speedily as possible; and, whenever it is practicable, they should be removed through the mouth. If permitted to remain, they expose to the danger of secondary hemorrhage, and increase the chance of subsequent disfigurement.

"Loose fragments of bone should be speedily replaced, unless very much detached from the flesh and periosteum, experience having proven that they unite in most cases with facility.

"No piece of skin which is torn up should ever be removed unless it is absolutely dead; but it should be laid back carefully in place, and retained either by a few delicate sutures or by some other gentle means of support. Tight ligatures and firm straps of adhesive plaster are apt to bind the tissues and destroy their little remaining vitality. The best means of supporting a fragment of skin in place, in many cases, is to lay upon it a thin piece of lint smeared with cerate, and over this a pledget of cotton-batting, securing the whole with adhesive plaster or a roller.

"As soon as the inflammation and consequent induration have completely disappeared, and not before, it will be proper to make the final anaplastic operations."

An addendum to these suggestions of Dr. Hamilton is to be made

by directing attention to the necessity of controlling and combating inflammation. To this end cold water is to be freely used locally, saturated cloths being renewed as the temperature is elevated; or the water may have to be medicated, lead and laudanum generally being added. A very admirable antiphlogistic application is prepared by adding to ℥xvi of water ℥ij of the former and ℥ij of the latter. If a patient should be robust and plethoric, it will in most cases be advisable to assist the local treatment by cathartics,—mag. sulph. or the ordinary Seidlitz powder being employed.

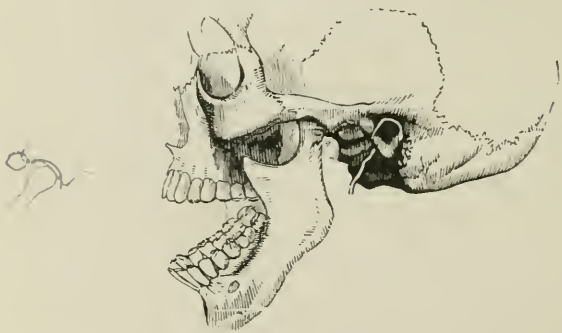
CHAPTER XXXIV.

DISLOCATION OF THE INFERIOR MAXILLA.

The frequency of this accident, the terror which it excites, and the harm resulting when not properly cared for, lend to it an importance which renders a careful appreciation of it a matter of much concern.

There are four forms of submaxillary displacement: complete dislocation, incomplete, bilateral, unilateral. In the first of these, one or both condyloid processes have slipped fully out of the articulating fossæ and rest entirely in front of the articulating eminence, as exhibited in the view.

Fig. 100.—Complete Dislocation of Jaw.



In the second, the condyle rests upon the inter-fibro cartilage, directly over the articulating eminence, and will remain fixed, or may fall backward or forward as directed by accident, not being retained in its position, as is frequently thought, by the coronoid process being hooked under the malar bones, but resting, as it were, upon a point, with complete balance in the muscular structures.

A bilateral luxation is a displacement of both condyles, and is of somewhat more frequent occurrence than the unilateral, or displacement of one side.

The diagnosis of a luxation is an exceedingly simple matter. An open mouth, with inability to close it, the lower jaw thrust forward in a straight line, or turned to the right or left, according to the accident, indicates a luxation of a bilateral or unilateral character.

The exciting causes of dislocation are various: yawning, vomiting, putting large bodies into the mouth, blows received upon the chin from above downward, or in front, while the mouth is open; the extracting of teeth, or extending the jaws widely for the convenient filling of them. The first case I ever met with occurred to a middle-aged man while immoderately laughing.

The predisposing cause of the accident resides in a general or special laxity of the articulations: thus, all are acquainted with persons who without effort will dislocate a finger or a toe. I have met with cases where the operation of removing a tooth was always attended with unilateral luxation unless a mento-occipital sling was used.

What is the condition of the parts in luxation? By placing the finger immediately in front of the tragus of the ear when the mouth is closed, and carrying it forward along the zygoma, the surface is found to be a plane. If the finger is kept on the surface, and the mouth opened, it is felt to drop into a fossa. This fossa is the glenoid; the concave rim above is the border of the cavity; the rounded prominence below is the condyle of the lower jaw. Placing the jaw of the cadaver in this position, and dissecting down to the articulation, the condyle is found slipped forward, resting upon the interarticular fibro-cartilage,—the fossa has been partially vacated, and the bone rests against the articulating eminence. If now the condyle is dragged downward and forward over the eminence, the glenoid cavity will be found completely vacated, and, unless by manipulation, the condyle cannot be restored; laying now back the soft parts, the cavity in front of the tragus will be found greatly increased, the finger falling into the unoccupied fossa. (An added diagnostic sign is then found to be increased depth and size of the fossa in front of the ear: this it is desirable to remember, as a fracture of the neck might simulate a luxation.) Returning to the examination, we find that to reduce this dislocation it is necessary to depress the head of the bone below the level of the articulating eminence, which, now being back of the condyle, serves to fix it in its abnormal position, as originally it was the means of its retention in place. But we pass to the consideration of the associate parts: the capsular ligament we do not find torn, as a rule, but stretched and elongated; the lateral liga-

ments do not seem particularly interfered with, and impress us as having little influence in the matter, one way or another; the temporal muscle shows itself stretched and dragged forward, but is seldom torn; the pterygoid and masseter are relaxed.

Dislocation is of more frequent occurrence in women than in men, is uncommon in children, and rare in the robust. When a dislocation has existed for a long time, there seems a tendency on the part of nature to make some compromise with the condition; the jaw will gradually recover considerable of the lost motion, and I have seen cases where it seemed the patient masticated his food without the least trouble. The original contour of the face I have never, however, seen entirely restored.

A luxation of the lower jaw, like the luxation of any other bone, if left unreduced, even for a very few days, will be found difficult to replace; the muscles become contracted, the condyle settles itself in its new position, lymph is effused and coagulates, and the general aspect and relations of the joint are changed. A patient, however, so situated is not, as remarked by Dr. Gross, to be left unassisted, or to the relief afforded by nature. In his System of Surgery, this gentleman relates a case in which a Mr. Donovan, an Irish surgeon, effected reduction ninety-eight days after the occurrence of the accident. Where ordinary means fail, Dr. Gross recommends that the efforts at reduction be aided by the subcutaneous section of any muscles implicated.

Subluxations are of very common occurrence, particularly among weak women of easy means and luxurious lives. In England, attention was first directed to the condition by Sir Astley Cooper; in this country it certainly has needed no particular one to discuss it,—a proof, perhaps, of the physical superiority of English over American ladies. This condition depends, evidently enough, upon a laxity of the ligaments, and perhaps more particularly on the weakness of the muscles of the part. In yawning, or not unfrequently in ordinary mastication, the condyle will slip forward on the articulating eminence, and, for a moment, the mouth cannot be closed, requiring, in many cases, the assistance of the hand to effect it. Depending on weakness, a permanent cure is only to be looked for as a higher and stancher vitality is secured. Thus, such a tendency and condition are to be treated by cold bathing, tonic medication, exercise, etc. In the case of a lady liable to such luxation, and who was made very nervous by its occurrence, the accident was entirely guarded against by the patient wearing the occipito-mental caps and bands.

I was once consulted by a lady who was awakened almost every night by the peculiar and unbearable pain attendant on such slipping of the condyle during the relaxation of sleep.

Dislocations associated with fracture are, happily, of very rare occurrence. I myself have never seen a case, unless, indeed, it existed in association with certain gunshot wounds, when an appreciation of the condition, if existing, would have been of very little moment. Delamotte records a case where, in the person of a girl, double luxation existed with fracture of the body of the bone. Another is recorded by Roberts, where the body was broken in front of the right ramus, and the condyle dislocated outward. A third case (Heath) is reported in the Dublin Medical Gazette, and "occurred in a boy of eight, who suffered a fracture at the symphysis, with dislocation of the left condyle upward and backward. There was bleeding from the ear, and the chin was much retracted and turned to the left; the mouth was open, but could be closed, and it was then observed that the lower molars overlapped the upper, but that the lower incisors were at least one inch behind the upper. Reduction was easily effected, and the case did well."

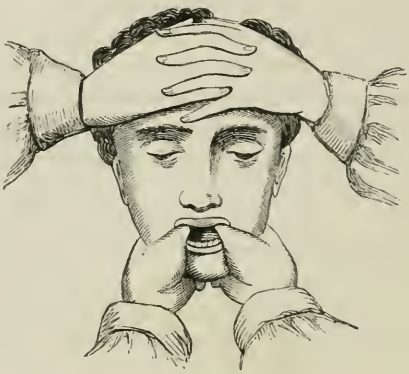
Luxations are sometimes congenital. The first case of this kind was noticed by Mr. Robert Smith, of Dublin, who gives with minuteness the results of his dissection. The patient, an idiot from infancy, died at the age of thirty-eight. The luxation existed on the right side, which was remarkably deformed, having a singularly hollow appearance, which strikingly contrasted with that of the sound one, which was unusually full and plump. The extremity of the finger could be readily pressed between the posterior margin of the jaw and the auditory canal, owing, as was found on dissection, to the absence of the condyle of the bone, which was, in fact, greatly atrophied nearly as far forward as the symphysis. There was no interarticular cartilage or distinct capsular ligament, and the masseter, pterygoid, and temporal muscles were much wasted. The temporal, malar, superior maxillary, and sphenoid bones were imperfectly developed, and the glenoid cavity existed merely in a rudimentary state.

Treatment of Luxation.—By referring back to Fig. 100, it will be plainly evident that the reduction of a disarticulated condyle consists in getting it back of the eminentia articularis. How best to do this is the question.

1st. Wrap the thumb in delicate napkins, seat the patient on a strong chair, and, standing behind him, rest his head against your

person; place now the protected thumbs upon his inferior molar teeth, and with main strength force the jaw directly downward and a little backward: the moment you have depressed the articulating face of the condyle, it will be felt to be dragged into place. The question of the force required to depress the condyle is the question of the muscular tone of the individual. In some cases the reduction is effected almost before you are aware of having exerted any pressure; in others it cannot be secured without the assistance of mechanical appliances.

Fig. 101.



2d. Failing to reduce a luxation standing behind a patient, reverse the position, resting the head against an assistant.

3d. Take corks, one or two, according as the luxation is single or double, force them between the wisdom teeth of upper and lower jaws as firmly and fixedly as possible; now gradually force the chin forward and upward, using either the hands, or a tourniquet applied around the head.

4th. Take a piece of wood about a foot in length, place one end upon the molar teeth of the luxated side, make a fulcrum of the molar teeth of the upper jaw of the opposite side, and elevate the end held in the hand. If the luxation is double, reduce one side at a time. In the use of this lever, I have secured the result more easily by resting the center of the piece of wood upon the molar teeth of the side to be reduced, carrying the end downward. I think it will be found the most satisfactory application of the power.

The forceps invented by Stromeyer yields a powerful leverage. This consists of two blades so expanded at the extremities as to fit,

as well as may be, the dental arches, these blades being covered with leather; a spring between the handles throws them apart, thus closing the blades. Reduction is attempted in two ways. Introducing the padded blades so that each shall rest upon its proper tooth or teeth,—the third and second molars,—the handles are grasped in the hands of the operator and gradually brought together; when thus the blades have been so separated that it is inferred that the face of the condyle is below the level of the obstructing eminence, the jaw is to be pushed forcibly backward into its place by an assistant.

Another method of using this instrument is the employment of a screw and nut which passes between the blades; a delicate wrench fits this nut, and through its instrumentality the handles are gradually screwed together, separating of course the blades. The manipulation of pushing back the jaw, Stromeyer, however, suggests, should be effected at the same moment with the sudden closing of the blades.

FIG. 102.—VERTICO-MENTAL SLING OR CAP.

5th. *Anæsthesia*.—In recent cases the anæsthetic agents may not be required, although there is seldom objection to their employment. In cases, however, of any standing, or in muscular persons, it often

happens that it is impossible to succeed in the reduction without the aid of relaxating agents; while again, the formation of adhesions will be found to make attempts at reduction both painful and formidable.

A luxation having been reduced, it becomes necessary to give support to the parts, and insure against the possibility of the mouth being too widely opened. This is most comfortably insured by a vertico-mental sling made of elastic straps.

CHAPTER XXXV.

OPERATIONS UPON THE LIPS AND CHEEK.

Hare-lip.—This defect consists in a break, single or double, in the continuity of the lip. The deficiency is almost precisely similar to that which exists naturally in the hare and rabbit, from which the imperfection gets its name. When congenital, it is always found associated with the superior lip.

A general view of the operation for the relief of hare-lip, and indeed the view which comprises or embraces the principles of the cure, is, that the margins of the cleft or break are to be pared, brought together, and held in apposition until nature shall secure a union. There are, however, nice surgico-mechanical associations, which are to be studied in connection with such principles of operation. Cutting manipulations upon the face, and especially about the lips, claim, it seems to me, more than ordinary skill and judgment. Such skill and judgment the surgeon should be prepared to exercise, if not for humanity's sake, at least for his own credit and reputation; for, as truly remarked by Mr. Skey, "on the more or less perfect result of such operations depend the appearance and expression of the patient for life." And surely, just so far as the surgeon shall beautify or mar, is the comfort of the patient, as well as his own reputation, influenced.

A proper and comprehensive study of hare-lip divides itself naturally into three subjects of special signification:

1st. The time of life best suited to the operation.

2d. The condition of the patient.

3d. The mode of operating.

"I advise you," says Mr. Liston, "to defer the operation till the first set of teeth come in, and I have seen good reasons for adhering to such rule. When the operation is undertaken at an early period, there is often great difficulty; sometimes union does not take place, the parts turn out again, and the patient is rendered more deformed than in the first instance. When the features are enlarged somewhat, you have more ground to work upon, you can put the parts

then neatly together, and you can almost answer positively for the union taking place. I operated," continues this gentleman, "on a child, the other day, in whom the operation had been performed twelve months ago. The parents were anxious to have it performed, but I then refused; it was done, however; but the moment the pins were removed, the lip turned out as before."

"For my own part," says Mr. Bransby Cooper, "I entirely agree with Sir Astley Cooper, in regarding it as unsafe to operate on infants before weaning: first, because, from their excessive irritability, they are totally unable to sustain any loss of blood; and secondly, because, after the operation, they are rendered incapable of sucking; and, indeed, Sir Astley has pointed out, in his lectures, the frequency of the failures he met with in his own practice, in operating upon infants shortly after birth. I consider the best time, under ordinary circumstances, to be soon after the child is weaned, as it is then capable of receiving nourishment independently of its mother, and has overcome the distress incidental to the separation from her."

Dr. Houston, of London, in examining the question as to the period of life best fitted for the performance of the operation, decides in favor of the third month after birth; urging, as his reasons, that the parts recover themselves better than when the operation is performed later in life; that the lip, in due time, acquires fullness and pliancy; the nose is prevented from assuming a spread-out, ugly appearance; the fissure in the palate, if there be any, closes greatly with the growth, if supported by a firm and perfect lip; bad habits of speaking, such as guttural or nasal utterance, which if once established become irremediable, are avoided; and, by removing the disfiguration before the child is conscious of its existence, it is spared the feelings of humiliation which the consciousness of such an infirmity necessarily imparts, and which invariably gives a tone to the character of the individual. He states that he has operated on several infants three months old, with equal success in all cases, and has never failed.

Dupuytren recommends the third month; Velpeau, the first six; but if that be already passed, he defers operating until the tenth or fifteenth year.

Skey, differing from Velpeau, says, "The operation may be performed at almost any age, but should not be undertaken under about six months."

"The period of life," says Mr. Fergusson, "which I think very

eligible for these operations, is either before the teeth begin to show through the gums, or shortly after the child has ceased to suck, provided the health seems good. If the patient is allowed to grow up, he is usually unmanageable until after the age of puberty; but, if possible, the malformation should always be put right before this time, as there is a better chance of the gum and nose assuming a good shape than after they have arrived at their full development. Indeed," continues Mr. Fergusson, "there are so many advantages besides these—as to speaking, appearance, etc.—that it is wonderderful any surgeon can recommend delay in such cases after the first or second year of life. I have myself," says Mr. Fergusson, "operated frequently within the first three months, and in some of these instances seen the child take the breast readily, with the pins still in the lip."

Dr. J. Mason Warren has operated on infants only a few days old, with perfect success. Professor P. Dubois read before the Academy of Medicine of Paris a paper on this subject, and referred to seven instances which had come under his notice, where the proceedings had been resorted to, and successfully, within the first few days after birth; and Malgaigne has followed a similar practice.

"From all my experience and reflections," deduces Mr. Fergusson, "I am more than ever disposed to recommend a very early operation. Within the last twelve months I have operated on five infants, all of them under three months, with the most satisfactory results; and these cases, with others I have previously had, are sufficient to induce me to pursue a similar practice in all instances of the kind which may come under my notice, unless there be some apparent indication not to interfere. An erroneous impression, as I suppose, prevails that children are remarkably subject to convulsions while undergoing operations; and this is often urged as a reason for not interfering with hare-lip in early life. Doubtless convulsions have occurred in some of these cases; but similar effects have been produced in the adult, and by less formidable means, too. Sir Astley Cooper has referred to several examples of this kind, but I imagine they must be rare indeed. I once asked Dr. Abercrombie, of Edinburgh, the result of his experience on this point, and he could not bring a single instance to his recollection where convulsions could be fairly attributed to an operation."

"At what period," says Colles, the famous Dublin professor, "should one undertake the operation for hare-lip? No doubt the earlier you perform it the better chance you will have of a speedy

cure; but infants at a very early age do not bear operations well; many of them will be seized with convulsions, and die, if subjected to a more trifling operation than this we have been considering. I think between the second and third year the best period."

"There are," says Professor Gross, in his System of Surgery, "few subjects in surgery which have been more frequently discussed during the last quarter of a century than the question of the period at which the operation of hare-lip may be best performed. My own opinion long has been that the most eligible period is from the third to the sixth month, or a short time before the appearance of the first teeth; the operation is then usually borne well, there is no danger of convulsions, and the adhesive process generally proceeds most kindly. In very simple cases I do not hesitate to attempt it earlier; and, on the other hand, in double or very complicated hare-lip I almost always postpone it until the child has attained its second or third year."

Dr. D. H. Agnew operates at any period; is influenced only, even during the process of dentition, by constitutional condition. If dentition is progressing quietly, that is, if there is no associated irritability, he can see no reason why the operation may not be performed just as well at this time as at any other; has operated in all the stages of this process. Dr. A. prefers, however, early operations; he thinks that his most successful cases have been on children who had not attained their tenth day. So far as interference with sucking is concerned, he remarks that he has seen a child take the breast almost immediately after an operation has been completed.

Professor Pancoast entertains about the same views as are expressed by Dr. Agnew. Dr. Pancoast gives it as the result of his very extended experience, that the operation may be about as well done at one time as at another. Does not see why the period of dentition is to be so cautiously avoided. Operates at any period of this process, if there are no contraindications of constitutional disturbance. Has operated on many children as early as a few days after birth, with the happiest results. Does not find the operation interfere materially with nursing.

Professor Henry H. Smith, of the University, says: "As respects the period for the operation, the earliest possible time after the tissues seem firm is to be selected, usually after the third month of infancy."

Now, although we have here cited such a variety of opinions,

which, to the inexperienced, may seem confusing, yet, when we consider the different circumstances under which these learned and experienced gentlemen have written and spoken, we are enabled to deduce from such experiences rules for guidance, in which, if my observation at all serves me, will be found data as reliable as we could well expect to possess. The views of such as I have mentioned will be found to represent fairly the diversity of opinion existing throughout the profession. These well-known authorities I have especially selected, because, being public teachers and writers, their views *in extenso* are thereby made the more easy to come at by any reader specially interested in this subject.

And first, in making up the sum of an operation, we are to consider, regardless of the age of the patient, the amount of shock such operation is to give, and the ability of the patient to bear this shock. This at once brings up the character of the defect, and the amount of operative proceeding necessary to its cure. A bad double cleft would inflict a much greater amount of pain than a simple single one, and consequently would inflict a shock double or treble in force to the last. Now, every man, woman, and child in the world has a certain amount of physique, and no more. The experience and physiological knowledge of the surgeon enable him to weigh the life-force. He must then decide, imprimis, whether or not his patient is equal in such force to the demands of the operation.

He must consider the condition of his patient. This brings up the second of the special propositions or stand-points from which the operation is to be studied. The possession of a capable physique does not imply that the life-force has not, like the tide, its ebb and flow. A child may have proper development, yet at the very time when it is presented for operation it may labor under temporary depression, the result of functional disturbances. A child, for example, just convalescent from cholera infantum, or just through with some of the exanthemata, would certainly not be as fit a subject for operation as though it had not suffered; it may have borne the demands made upon it very well, and come out of the ordeal looking strong; but then it is the last feather that bends the camel; the system that endured bravely the one demand may not have a residue of force on hand that will just then meet another. Give such a system time; get it back to the condition in which the first demand found it, and you then have it certainly capable of the same resistance and of the same endurance. Again, a patient may not be up to the required tone, and yet circumstances render a speedy

operation desirable. We can assist nature. Exercise, fresh air, and proper food can do much. The last may imply that the milk of the mother, if the child be nursing, be exchanged for that of the hired nurse. Who has not examined the milk of a mother or wet-nurse and found it greatly deficient in some important constituent? I have seen babes growing visibly weaker and more puny day by day; I have seen physicians baffled because they could find no one portion of the economy less healthy than another. I have seen the microscopist take the milk on which such a babe has been feeding, and, looking at it through his glasses, find it half made up of cholesterin. A change of milk has effected immediate change in the child. A child may have fibrinous blood to excess, tending to undue inflammatory action, or the lymph which such blood would exude might be so corpuscular in character that a wound would at once take on suppurative action. Either condition would be adverse to an operation. Yet we have antiphlogistics for the one and tonics for the other. A seemingly strong child may be in a typhoid state, and a blushing cheek may be but the effect of hectic or excitement; typhoid blood has, comparatively, no fibrin. If you were to perform an operation on such a patient you would be sure to have a failure for your pains. I have had under my care patients in just such a typhoid state, where the pulse would be bounding and the face always flushed; such a quick pulse and flush is, however, the result of the very deficiency in the blood. A child may be cutting its teeth, yet this does not necessarily contraindicate an operation. It is not every child that has convulsions and kindred troubles with the cutting of its teeth; many a child goes through the whole process of dentition without cause upon which to ground a sob. If a child is brought to the surgeon, cutting teeth, with an operation for hare-lip to be performed, and there is associated with the dentition no general or special local disturbance, why should he not proceed, *cæteris paribus*, at once to operate? I can see, and I have up to this time met with, no objections to so doing.

The next consideration is the operation itself,—the modifications of the one principal operation, and the variety of clefts influencing such modifications.

A basis operation might best be represented by a simple V-cleft, having the mesian line of the lip as its center,—the indication being to restore such lip to a normal contour. On examination with the glass, we find that the normal lip has no break in its continuity; we find what may be termed the center of the lip represented at its free

margin by a projection of more or less graceful curve. We find, extending from this free margin up to the nares, and bounded laterally by the alæ nasi, a fossa,—the fossa labialis. From this fossa we find the lip on either side spreading itself out to be lost in the cheek. To meet the indications of this case we must remove the break in the continuity, create a mesial projection, and give to the center a fossa. To fulfill such indications requires a study of the conditions from a surgico-artistic stand-point. We want, first, to remove the cleft. This in itself is easy of accomplishment; we have only to pare the edges and sew, or pin, the raw surfaces together. But in viewing this first step a little more closely, we perceive that a common V-paring from the edges of the V-break would defeat our purpose in securing either a center fossa or a mesial projection; the mode of bringing the parts together would put on the stretch such fibers of the orbicularis as are associated with the margin of the lip, while all that portion farther up would be comparatively relaxed; thus our fossa would be a promontory, and our soft median swell would be a stretched mucous membrane. Such an operation would, then, in meeting the first indication, destroy our ability to fulfill the two others. We must, therefore, instead of the V-cut, seek a better; for on the way in which we pare our edges depends the fulfillment of all three of the indications. An ellipse suggests itself, and such a paring will meet our wants. 1st. It enables us to bring the edges of the cleft together. 2d. The center of the ellipse is its greatest diameter, and this center is the center of the lip. When we bring together this most widely separated part, it necessarily projects the most yielding surface—and such surface is the free symphysis of the lip; thus the second indication is met. 3d. The greatest stretch on the muscle is in the site of the myrtiform fossa, with a necessary relaxation above and below; and thus the last indication is met; for, as the result of such a condition of the parts, we have a fossa formed and a promontory at the free mesial line.

Remarks.—The paring of a cleft should always be constant in the one feature of being V-shaped, as reference is had to the base of the V looking toward the throat; this allows for excess in the retraction of the skin over the mucous membrane. If this precaution is neglected, a difficulty is likely to be experienced in the gaping of the cutaneous portion of the wound.

The subject of retaining the parts in apposition, with regard to suture material, has elicited much controversy. The ordinary operation is as follows. After you have pared the edges of the cleft,

take up a needle threaded with the ordinary waxed silk, pass this through the free margins of the lip and bring the parts together; this is to insure a satisfactory approximation at this point. Next take two ordinary steel pins and pass them at equidistant points on the lip,—they must go, in depth, at least half its thickness; these pins are to enter and emerge at least five lines on each side of the fissure. Silk ligature stuff, in the shape of the figure-of-8, is now to be passed about and around these pins. Adhesive strips are next passed over the pins, a slit being made for their accommodation; the object of these strips is to press tissue toward the wound, in this way preventing tension. If blood oozes out and clots upon the ligatures, it has been considered rather favorable than otherwise, as it has been thought to add to the support of the parts. After two or three days the pins are carefully removed by a rotary motion; the ligature material and adhesive strips are allowed to remain from four days to a week longer.

The ordinary hare-lip pin is objectionable; it is too large. The figure-of-8 ligature in connection with the pin is equally to be condemned. Wherever we see a case of hare-lip that has been thus operated on, we see four ugly scars on either side of the cleft: these are the points at which the pins entered and emerged, and upon which the figure-of-8 ligature made its greatest compression; the parts ulcerated, and the scars are simply the cicatrices from the healing of such ulcers.

Various means have been suggested to be employed in lieu of such a dressing. Dr. Agnew, in a conversation I had with him lately on the subject, informed me that he now uses silver wire altogether. He simply sews the parts together with a greater or less number of interrupted sutures. He thinks such sutures possess great advantages over the pins.

Another means of bringing the parts together that has been suggested, is the employment of the interrupted suture of silk from the under surface of the lip. In one case, however, where I tried this method the result was very unsatisfactory.

Dr. Washington Atlee has suggested a suture which differs only from the ordinary pin and figure-of-8 in that he employs rings of india-rubber, which are stretched over the pins. This suture for many purposes must prove an admirable addition to the armamentarium chirurgicum; but in hare-lip operations it has no advantage that I can see over the ordinary figure-of-8, inasmuch as the same strain, if not a greater, is exerted upon the points at which the rubber is sup-

ported by the pins. The merit claimed for this suture is, that whether a part swells or remains normal, the compressing force continues about the same.

A mode of securing the apposition of the parts, which I think will be found very satisfactory, is to take three, four, or more pieces of silver wire,—the fewer you can get along with the better, the gauge being the most delicate that can be procured; pass these and let them emerge at lines which shall very nearly correspond with the commissure of the lips. Next take a strip of common sheet-lead, and, cutting it to an appropriate size, make in it as many little holes as you have threads of silk to either side; pass the threads through these holes, and compress on each a McLean button—*i.e.* a simple flat shot. Now, with the fingers, nicely approximate the wound. This satisfactorily accomplished, draw up the wires and fix them on a second piece of sheet-lead, as in the first instance. If the center, which is the point of the wound, tends to bulge forward, a delicate compress is to be placed over it, and bound to its place by a verticolabial sling. The advantages of this dressing are, that it may be retained for weeks, if necessary. It is entirely unirritating. The wound is perfectly open to examination, and, more than all this, the threads, being unirritating and very slight, when taken away leave no scars.

A still happier dressing, but one which can be applied only on such patients as have reached the age of intelligence, is a modification of Dewar. Dewar's compressor may be likened to the ordinary double hernia truss. It consists simply of a spring which passes around the head, having a small pad at each extremity. The piece is of such circle and character as to bring the pads to the labial commissures. The instrument is held in position by any convenient means. Dewar holds it by what might be termed a fronto-sagitto-lambdoidal sling. The process of dressing with this instrument would be as follows. After making the paring of the cleft, cleanse the parts well with cold water (controlling hemorrhage by pressure on the facial arteries); next take a strand of the common silk ligature material, and nicely approximate the free edges of the lip, passing the needle on the under side. The next step is the application of the compressor. With the thumb and finger force the tissue of the cheeks toward the mesial line of the lip—this approximates perfectly the edges of the wound; replace your fingers by the compressor, and the parts are held *in situ*. If the approximation of the wound thus made should not, however, be satisfactory, secondary

compresses of linen may be placed more immediately about the wound, and fixed by a delicate roller. The advantages of this dressing will be at once apparent. There are no pins or ligatures used, consequently there is nothing to interfere with direct union; there are no punctures made in the skin; of course there is no risk of having any but the single linear scar, and even this, if direct union is secured, must be slight indeed. The parts can be examined at any time without important interference with the apparatus.

In some individuals the coronary arteries are quite large. To suppress the hemorrhage from these vessels, dependence is generally placed on the pressure exerted in bringing together the edges of the wound. If such pressure does not answer, or if we should prefer some dressing that will not make this pressure, light ligatures may be thrown around the vessels, one end to be cut off, the other to be brought out on the back part of the wound. Ligatures, however, are to be avoided when possible, as they interfere with proper union.

A much better means than the resort to the ligature is compression of the facial arteries. Such compression needs to be kept up but for a short time, as the smaller artery soon contracts. Dewar's compressor controls the hemorrhage by its pressure on the coronary arteries, and its action may be very readily imitated with the common compress and roller.

There is a feature associated with the formation of the linear cicatrix, and the unsightly notch which so commonly deforms hare-lip patients, that I do not remember to have ever seen alluded to, but which is of such consequence as to merit the closest scrutiny. Is it the fault of nature or the fault of the surgeon that the operation gives any cicatrix at all? Cicatricial tissue—*tissu inodulaire*, as Delpech more happily terms it—means accidental tissue—new tissue formed from granulations. The existence of inodular tissue implies, as it is greater or less in amount, that a wound has healed either by primary or secondary adhesion, and certainly not by what Mr. Hunter terms union by first intention, or what Mr. Paget calls immediate union. If a wound is made to unite by first intention, there cannot possibly be any observable inodular tissue or scar, because so little new tissue has been formed, blood-vessels and nerves have been brought into perfect contact, and the harmony of the parts has been so completely restored that after a few weeks the closest observation fails to discover the seat of accident. We have familiar examples of such union in the slight cuts we are constantly giving ourselves with the razor, the cuts we get about the fingers,

etc. Some years back I removed from the parotid region of a young man a tumor fully the size of a hen's egg. The flaps were adjusted with the greatest care, and held in place by compresses of old and fine linen. I saw this gentleman about ten weeks after the operation, and so immediate had been the union that it was impossible to say where the cut had been made. Mr. Paget mentions very large wounds that not unfrequently heal in this perfect manner. One case, that of a lady who had been operated on for scirrhus of the mammary gland, might be specially alluded to. Speaking of the operation, he says:

"The flaps, which were very large, had been carefully laid down, strapped with isinglass plaster, and well tended. After death, which occurred in three weeks, from erysipelas and phlebitis, I cut off the edges of the wound with the subjacent parts, expecting to find the evidences of union by organized lymph, or, possibly, blood; but neither existed; and the state of the parts cannot be better described than by saying that scarcely the least indication remained of either the place where the flap of skin was laid on the fascia, or the means by which they were united. It was not possible to distinguish the relation which these parts held to each other from that which naturally exists between subcutaneous fat and the fat beneath it. There was no unnatural adhesion; but the subcutaneous fat which did lie over the mammary gland was now connected with the fascia over the pectoral muscle. The parts were altered in their relations, but not in their structure. I could find," continues Mr. Paget, "small points of induration where, I suspect, ligatures had been tied, or where possibly some slight inflammation had been otherwise excited; and one small abscess existed under the lower flap. But, with the most careful microscopic examination, I could discover no lymph or exudation corpuscles, and only a small quantity of what looked like the débris of such oil particles or corpuscles of blood as might have been between the cut surfaces when the flaps were laid down. In short," says Mr. Paget, "this was union by first intention; it was immediate, at once in respect of the absence of any intermediate substance placed between the wounded surfaces, and in respect of the speed with which it was accomplished."

The union of a wound by adhesion or by granulation implies a certain amount of inflammatory action, and the exudation and organization of lymph. This is the way in which hare-lip wounds are healed, and this is why we have the linear cicatrix; and not only the cicatrix, but, according as the union has simulated or departed from the immediate type, we have a great or small notch.

But how is the notch formed? The explanation is simple enough; but it is not that generally given; at least, I think not. The notch is the result of the natural contraction which belongs to fibrous tissue, of which fibrous tissue the cicatrix is formed; and if we observe, we will find that where this linear inodular tissue exists in excess, a large notch is always associated with it. If we need further proof to convince ourselves that such contraction is the cause of the notch, we have only to remark that in cases of large cicatrices the destruction of the symmetry of all the surrounding parts has invariably occurred; the contraction has puckered, as it were, the whole lip. When the linear cicatrix is very limited, the notch is correspondingly small; and these conditions could not so uniformly exist associated, if it was the manner of the paring exclusively that gave the notch, and not the contraction, as I have described.

The nearer then the approach to a union by first intention we can make in hare-lip, the better for our success will be the result. But can we not get immediate union in full? This would imply that we have artery to artery, vein to vein, nerve to nerve. Well, the artery is a prominent point of reference, and the relations of surrounding parts are in perfect unison. If we can get the mouths of the two arteries together, will not all other vessels assume, by compulsion, inosculation? We may try for this, at any rate; such care will necessarily insure to us the very nicest approximation of parts, and if what is termed immediate union cannot be obtained, we may at least secure to our patient, by such care, the smallest possible scar.

To return now to the modifications in hare-lip, and the operations.

The first modification of the simple cleft described is where the break is to the one side or the other, being bounded in either instance by the mesial line. This character of cleft, particularly so far as the left side is concerned, is by far the most common type; indeed, it may be denominated the type proper of hare-lip. In operating here, it is readily seen that the simple ellipse, as practiced in the previous case, will not answer. Such a cut would give the labial swell and fossa to the one or the other side of the mesian line, according as the break extended right or left.

In these cases the indications are met by the operations of Malgaigne. This surgeon makes the one side of a simple V-cut on the external flap, while he practices the semi-ellipse on the mesial flap. This, it is seen, brings up the outside flap, and projects the apex of the mesial one. A modification of this operation, and a decided improve-

ment, in my opinion, is one first suggested, I believe, by Dr. Richard Levis. This consists in making a kind of double V-cut on the mesial flap. The knife is entered just below the nostril, and the first incision takes the line of the one side of the V. On nearing the free surface, however, this direction is changed, and a second V is cut out of the substance of the flap. This mode of operating secures a very nice labial swell, and will be found sufficiently easy of performance. To bring out to the level the notch thus made, implies some force; and if it should be designed to use Dewar's compressor, it must always be associated with a point of silver suture; the suture being introduced from the mucous surface.

Another, and the next most common variety in hare-lip, is that in which the break is double—that is, the single break is divided into two parts by a teat which starts out from the apex of the cleft; this teat is seldom more than half the width of the lip. For the correction of this defect, various means are resorted to. Some surgeons cut out the teat, thus converting the double into a single break, making the basis cleft as described. Others, on the contrary, after paring all the four sides, tease and strain the center piece or teat until they get it on a level with the rest of the lip. Both of these operations are very objectionable. The first takes away an unnecessary amount of substance from the lip, thus giving a tense, stretched appearance to the part; while the natural resiliency which belongs to most tissue insures, from the second manipulation, a character of notch or central depression almost as unsightly as the original deformity. In this simple form of double hare-lip, I think it will be found the most satisfactory operation to pare the lateral flaps in the elliptical form as described, while the center teat should be pared into the V-form, the base being to the septum narium. All the parts will thus be found capable of a neat approximation; the teat doing its share more or less in filling up the break. The approximation is to be made as in the mode described.

A second form of double hare-lip is that in which the alveolar process is associated with the teat. This is termed complicated hare-lip. The portion of process projecting into the cleft is generally an intermaxillary formation, and holds the germs or developed incisor teeth—generally the centrals alone. The correction of this defect implies a somewhat formidable operation. The first step consists in separating well the lip from its reflection over the process. Next the gum is separated thoroughly from the projecting bone, which bone the third step in the operation removes down to

the natural curvature of the parts, either by means of saw, chisel, or cutting forceps. For myself, I prefer the chisel; it is certainly a much more convenient instrument than the Hey's saw so commonly employed. A straight and curved chisel should always be at hand. If in this third step of the operation the anterior palatine artery is wounded, the resulting hemorrhage is easily controlled, either by taking up the vessel or by touching it with one of the astringents; or, if neither of these means suffices for its accomplishment, the artery may be touched with a red-hot cauterant needle, or it may be plugged with a point of pine stick. The bone removed, the flaps of gum may be laid back in the cavity, where they will remain sufficiently approximated without the employment of any sutures. The operation upon the lip may now be performed at once in the manner described; or, if the force of the patient is too much exhausted, it may be left for a future period.

These are the two principal forms of double hare-lip. An appreciation of the operations required for their cure will enable the surgeon to meet satisfactorily any modifications that may present on either of them; and these modifications, it is to be suggested, are constantly occurring. Let us, for a single moment, refer to an uncomplicated double hare-lip, where the center piece, or teat, as I have called it, might be found so large and square as fairly to divide the lip into three parts. Now, here the mesian line of the lip would be formed by the center piece; it would therefore, I think, suggest itself to any one that either side of the cleft was to be treated as a separate hare-lip—that is, the whole manipulation might be done at the one sitting; but there would have to be symmetrical parings made of either cleft. In such a case, we have also to take into the account the concavity made on either of the sides of our fissure, as reference is had to the influence exerted on the free margin of the lip; for here of course we require no swell. Whether, again, in these really double cases, we would first operate on the one side, and, when this was cured, on the other, is a matter which should be left to the judgment of the operator. Many surgeons prefer to correct the whole deformity at once. If we should do this, the operation would only deviate from the principles laid down, as regard would be had to approximating the parts. If the center piece might be small, I think it would be found the most satisfactory practice to pass the pins, wire, or whatever suture material might be used, directly from one lateral flap, on through the center piece, to and through the other, thus uniting all the parts together by a

common suture. If, on the contrary, a center piece is broad and well covered by skin, I think that the greatest good would be found to be secured by using two sets of ligatures. As regards the single or double operation, I myself am influenced by the width of the middle piece, the tenseness or laxity of the tissue of the lip, and the endurance and condition of the patient.

Another modification of the double hare-lip is one in which there is a projection into the cleft of the incisor teeth, the alveolar process itself being sufficiently normal to allow of non-interference with it. This modification is commonly met with in the adult alone, or at least after second dentition. The projection of the teeth is the natural result of the lack of external support from the labial deficiency; the tongue has actually pushed them outwardly. This explanation will, I am sure, seem strange only to such as are unacquainted with the exceeding mobility of the dental organs under slight but continued force. It is certainly the true cause of such projection. In a case of this kind, a preliminary operation is the removal of the teeth. If, now, six months are allowed to intervene before attempting the operation on the lip, the alveoli of the extracted teeth will be found to have receded, through absorption, quite the eighth of an inch. The second operation is then to be done *secundum artem*. This waiting on the process of absorption will be found greatly to conduce to a successful result.

A still better though more tedious mode of correcting such a deformity is by first bringing the projecting teeth back to their normal place in the arch, through the agency of elastic ligatures. This is a perfectly feasible operation, and not at all difficult of performance. By such a preliminary procedure we not only get the teeth out of the way, but we save to the patient these valuable organs. To make and apply such a ligature, we have only to take a slip of common india-rubber and attach at either end loops of silk. We next take these loops and place them over certain of the molar teeth; it is entirely immaterial which. The center or rubber part is next stretched forward and laid over the labial faces of the teeth to be pulled back. It is astonishing how quickly and powerfully such a force will act upon the teeth. In two or three weeks, at most, the teeth may be brought into their proper line. To secure them in situ, and prevent their being again pushed forward, we have only to keep them ligatured in any convenient manner until the operation on the lip is made.

Cleft of the lip, as previously remarked, is common to almost

every case of cleft of the hard palate. It has always been deemed very important in these cases that an operation on the lip should be performed as early as possible; it is thought to favor the union of the bony cleft. In these cases the operation differs from that suited to any ordinary one only when there is projection of one or both alveolar prominences into the break. In such instances, if the projection is very marked—that is, so much so as to prevent the bringing together of the lips over them—we may perhaps be able to do nothing better than cut away the parts. This, however, is always to be avoided where possible,—first, because we thus destroy the germs of the teeth; and, secondly, because, if by any means we can get union of the lip, the parts in their development will come mutually to accommodate each other. In such cases it is recommended by some authors that we endeavor to bend back these juttings of bone, turning them in toward the mesial line. Where this can be done, it answers a very admirable purpose. Still another mode—after the method which I suggested for the complete relief of this character of cleft—consists in the employment of the fronto-occipito-labial elastic sling. This sling is so applied that it pulls upon the projecting process backward from the occiput. It will certainly fulfill the indications; but its employment is not unattended with trouble.

Cases of double hare-lip not unfrequently occur where the center slip is so associated with the septum of the nares as to make the parts seem as one. If there was not the loss of material from the lip, the septum would bear being described as in a state of hypertrophy. Again, the lost part from the lip is sometimes found attached to the very tip of the nose, giving to the patient the appearance of laboring under lipoma. These, together with all the anomalies in this direction, are first to be studied, as regards their cure, from the artistic stand-point. The surgeon knows where and what he can afford to cut; he knows what nature will do in the case; it only remains for him to consider well his incisions—where he shall make them, and what is to be the result before the operation is attempted.

A useful study is found in the examination of examples. If we familiarize ourselves with all kinds of cases, and if—what is still better—we represent the morbid anatomy in india-rubber, and thus devise and try experimental operations, we shall, I am sure, find the subject of hare-lip grow simple enough.

Excellent studies will be found pictured in the following works:

Liston & Mütter's Surgery, page 187; Erichsen's Surgery, page 690; Gross's Surgery, pages 611, 612, 617, vol. ii.; Fergusson's Surgery, page 494.

Addenda.—In operating for hare-lip, always first dissect the lip well off from its attachment to the gum.

In paring the fissures, the young surgeon is much more apt to remove too little than too much.

In paring out the apex of the cleft, be sure to freshen perfectly the extreme point of such apex. This is oftentimes neglected; and an ugly pucker is the result.

The paring for hare-lip is, perhaps, best made on a wooden spatula.

Few instruments are really required in this operation. A scalpel and forceps, together with such ligature material as it is designed to employ, will answer the purpose well enough.

The best mode of operating on the infant is for the surgeon to seat himself face to face with an assistant. The child being etherized, the surgeon lays its body over his own knees, the head being supported by the assistant. Upon the incision being made on one side, the assistant grasps the lip between the thumb and finger, compressing the coronary artery. When the artery of the opposite side is cut, he secures this. Both are steadily held until the operator is ready to coaptate the wound.

In operating on the adult, I think it will be found the most convenient plan to stand behind the patient; such a chair being used, and the head being placed in such position, as recommended in the operation of staphyloraphy.

Another very convenient manner is to sit in front of the patient, the head being supported against the breast of an assistant.

When plaster is used to assist the ligatures, silk gauze and collodion are to be preferred; this leaves the wound constantly exposed to inspection, and is a light and most effective dressing.

CHAPTER XXXVI.

OPERATIONS UPON THE LIPS AND CHEEK.

As the result of disease or accident, persons occasionally suffer from contraction of the orifice of the mouth; a most unhappy condition, both as regards the appearance and the comfort of the individual. Such contractions are represented in the plate, Subfigs. 7, 8, and 9.

Dieffenbach, of Berlin, who interested himself very much in the surgery of the mouth, suggested and practiced for the relief of these deformities an operation, which, with occasional slight and unimportant modifications, is the one still generally employed.

Dieffenbach's operation is performed on the following principles: Map out with pen and ink on the tissues such lines and angles as shall meet your approbation of what the proper mouth should be. These lines are, of course, to be in conjunction with the existing orifice or commissure, wherever or however situated,—that is, the relation of the existing orifice must be studied as it is to have association with the cuts you are to make. Thus, if we glance at Fig. 7, we at once appreciate the necessity for enlarging the mouth by sections equilateral to the center, as certainly it is apparent enough that only by such a form of incision—which I have caused to be represented by a line—could we secure the end at which we aim. Fig. 8, on the contrary, would demand an operation exclusively lateral; for here the mouth at its right angle is as perfect as we could hope to make it. Fig. 9 presents us with a complication on these simple conditions. These complications might be multiplied almost *ad infinitum;* for who may say in what condition a wound or other injury shall leave a part? At any rate, the surgeon is to be prepared to meet any and all kinds of modifications. These three figures give perhaps as just an idea of the mechanico-surgical indications of such cases as any others that might be drawn. Figs. 7 and 8 are from life; 9 is one made up to represent a not unlikely aspect.* It exhibits, as is seen, a combination of the cicatrix

* Fig. 9 is not correct to the text: add to it the defect in Fig. 1, and it will be right.

and hare-lip. In this last case is suggested of itself the necessity for a double operation. The mouth is to be made smaller before it would be at all proper to attempt making it larger. We must first perform a hare-lip operation. Imagine this done, and then further the condition in which such operation would leave the orifice. If we refer to the drawing, we see that the opening is now at what is properly the right angle of the mouth, and an operation for the making of a proper commissure, if there was no hare-or cleft-lip, would be precisely the same lateral incision as that indicated in case 8. But then it is to be remarked that, after the first operation was performed, the orifice would not be, as now, at the proper right angle. The bringing of the cleft together would pull it naturally toward the mesial line. Thus, then, it is made a cross between 7 and 8; it is not like 7, because it is not exactly in the mesial line, and it would not be like 8, because it has been drawn from the proper right angle toward the mesial line. Here, then, the complication has materially changed the indications of the principal operation. The incisions would have to be bilateral, but yet not equally so as reference is had to the false commissural center, but only as reference would be made, say to the septum narium or any other fixed mesial line proper. The space between the central incisor teeth would be a good mesial center to take.

These features well considered, we take up a pair of sharp-pointed scissors, and, passing a finger of the left hand into the mouth, enter one blade of the scissors down through the tissues toward the finger, sparing alone in the puncture the mucous membrane; the blade is now pushed forward toward the mesial line, and the tissues incised, as indicated by the superior right lateral half of the ellipsis represented by the line in Fig. 7. The scissors are now reintroduced at the previous point of entrance, and the cut made on the inferior lip precisely as was done above. Next dissect out the triangular piece. Repeat these incisions on the opposite side. The next step considers the incision of the mucous membrane. This is done simply by dividing it down the center to within two or three lines of the angle of the wound; it is then to be brought over the cut surfaces and attached by means of the interrupted suture to the skin.

This mode of re-establishing the orifice of the mouth is thought by many surgeons to be the best that can be employed. Professor Smith, of the University, reports two cases operated on after this method, which resulted, he says, to his entire satisfaction.

The late Professor Mütter reports similar satisfactory results. The following interesting case is from his practice:

The patient was a daughter of a respectable practitioner of medicine residing in South Carolina, and, at the time the accident productive of the deformity occurred, was about eleven years of age; of fine general health, though of a temperament strongly lymphatic.

In the commencement of the winter of 1835, while at play with her companions, she was by some means or other thrust against a heated stove, by which her hands, arms, neck, and the lower part of her face were severely burned.

Her wounds were treated in a most judicious manner by her father; but, in spite of all his efforts, those about the mouth cicatrized with so much contraction that the entrance into this cavity was almost obliterated. As soon as the tenderness of the part was somewhat diminished, he commenced a course of treatment calculated to restore this orifice to its natural size. He first began by introducing sponge tents, which were allowed fully to distend themselves; but, after repeated attempts with them, by which he caused the child much suffering without materially benefiting her, they were abandoned.

He then attempted to dilate it by first making an incision about six lines in length, extending from each angle of the mouth in an outward and nearly horizontal direction, and afterward introducing the tents to prevent the lips of the wound from uniting. This appeared at first to be productive of some good; but in a short time they contracted and cicatrized, and the patient remained in as uncomfortable a condition as before.

Finding himself foiled in both attempts, he determined to bring her to Philadelphia for the purpose of consultation. She was accordingly brought on, and became a patient of Professor Mütter, who says, "When I first saw her, nearly a year had elapsed since the occurrence of the accident. Her appearance at the time was very singular. Firm and dense cicatrices nearly surrounded the mouth, but were most marked on the lower lip and about the angles; while the orifice of this cavity was barely large enough to admit the point of the finger, and presented an oval form. The cicatrices of the incisions made by her father were also very apparent at each angle. Her general health was perfect; and it was only on account of the deformity and difficulty of taking her food that the operation was requested. Her speech was not much affected; although some of the labial sounds were imperfectly pronounced. The lining membrane of the mouth was perfectly normal."

"From the history of the case," says Prof. M., "I concluded it would be utterly useless to attempt a cure by the repetition of the measures already employed, and which are the only ones usually had recourse to. I therefore proposed the operation devised by Dieffenbach, and, her father consenting, it was accordingly performed on the 28th of the month of consultation.

"The operation completed, a common roller bandage was applied, as in cases of fracture of the lower jaw, in order to prevent any derangement of the wounds. The patient was then placed in bed, with her head elevated, and as she had just before the operation eaten freely of some light food, ordered to take no nourishment of any kind until the next visit, and to be perfectly silent.

"29th. Passed a good night; slept well; no fever, and complains of no pain; parts merely a little sore; needles all in place; writes that she is hungry. Ordered thin oat-meal gruel as diet, which, as well as her drink, is to be given with a small teaspoon.

"30th. Quite as well as yesterday; everything in place; bowels costive; ordered an injection of white soap and water; diet as before.

"31st. Complains of stiffness in the wounds, but no pain; dressing all secured; injection had operated well; pulse natural; ordered chicken soup for diet.

"Dec. 1st. The bandages were removed, and the first dressing commenced. The sutures, which had been closely bound down to the parts by blood, were carefully softened with warm water and cut away. As soon as they were removed, and the parts properly dried, the most gratifying exhibition of the success of the operation was afforded. On both sides, union between the everted mucous membrane and the margins of the wounds had taken place nearly throughout, and the new lips presented an appearance almost natural. Some of the needles were then removed; but, as there appeared to be a feebleness in the adhesion at some points, the needles passing through them were allowed to remain, and a thread cast loosely around them. The bandage around the head was also reapplied.

"2d. Second dressing, parts all firm and healthy; the remaining needles were now removed, and the bandages only reapplied, which was done to prevent talking; no pain in the part, and the patient in fine spirits. Ordered bowels to be opened with an injection, and the diet to be more nutritious, but still liquid.

"Nothing remarkable occurred in the subsequent treatment; all dressings were taken off on the 15th, and the child allowed to pursue her ordinary course of life. The mouth presented a very good

appearance, though the lips were somewhat thinner than natural, and there was some difficulty in bringing them in close contact, especially at the central portions."

Mr. Liston reports a case of equal interest. Mrs. H., aged twenty-two, was knocked down in a brawl, and a man jumped upon her, lacerating and bruising her cheek and mouth extensively, and fracturing her jaw. She went to St. Thomas's Hospital, where her jaw was put up and bandaged. These were not removed for some time; and, when taken off, the wound on the right side of the mouth was found healed, and the cicatrix considerably contracted; since then the contraction has continued somewhat, and now is so small that she can scarcely get any solid food to pass her lips. There is a large, dense, white cicatrix on the right side of the mouth, rather puckered, and sharp toward the angle of the mouth. An operation was performed on the 23d. Mr. Liston removed a triangular portion of the cicatrix on the right side of the mouth, dissecting it off the mucous membrane, which was then divided to the extent of the external wound. Lint dipped in cold water was then laid over the surface, to suppress the oozing of blood, which was by no means considerable. About five hours after the operation, all oozing having ceased, the mucous membrane was turned over the cut edge of the cicatrix, and united by three or four points of suture to the skin of the cheek; by this means a mucous surface was secured to the newly-formed prolabium, and the gradual cicatrization and consequent contraction dispensed with.

History of the case, from notes:

24th. A little swelling around the wound; not much pain.

25th. The sutures were removed to-day. Adhesion appears to have taken place between the mucous membrane and skin. Water dressing to be applied to the lips.

Nov. 1. The water dressing has been continued; union between the mucous membrane and skin took place to a considerable extent by the first intention. The remaining parts are granulating favorably. The mouth is much improved in appearance and usefulness.

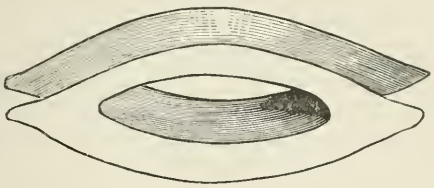
4th. The lip nearly healed, only a small sore remaining in the lower lip. Red wash dressing to be applied to it. Discharged much relieved.

A modification of the mode of Dieffenbach, which I would suggest, and which I am confident will yield still better results, is an association with these surgical means of a mechanical appliance.

After the operation, as described, has been performed, and time

has been given for union of the reflected mucous membrane, let such an appliance as I have here figured (mouth-stretcher, it might be called) be prepared and slip it between the lips. This stretcher

Fig. 103.



represents a properly-shaped mouth; the lips in the whole of their circumferences are caught and held by the gutter of the apparatus, and thus not only is the healing influenced to a desired shape, but undue cicatricial contraction is prevented.

If it is objected that such an instrument would look ungainly in the mouth, I have only to answer that after the first week or two, there would exist no occasion for its constant wearing; it might be entirely dispensed with during the day and be worn only at night. Such use of it, however, should be continued at least six months, if we would have the cure perfect.

An advantage that would be yielded by such an appliance to a bungling operator would be that it would naturally correct any imperfection in his operation; the character of the apparatus compelling the regular healing of the wound. Indeed, I am not sure but that in this way a proper mouth might be made if the strictly surgical part of the manipulation consisted only in a simple incision to enlarge the parts to a proper capacity. For in the operation it cannot be said that the reflection of the mucous membrane is an absolute necessity; whether this membrane should be carried over the cut surface or not, we would very soon have it clothed with such tissue, or at least with that which would be found sufficiently analogous to fairly represent it. Dr. Mütter, in remarking on the philosophy of this operation, suggests that the annals of modern surgery hardly afford an example of greater ingenuity than the procedure of Dieffenbach. "The great difficulty," he truly remarks, "in all these cases arises from the constant tendency to contraction manifested by the cicatrix, which occasionally goes on to such an extent that the orifice of the mouth is almost closed. At the first examination of such a deformity, the remedy which seems to promise most success,"

says Dr. M., "is mechanical dilatation. Unfortunately, this is productive of but temporary relief, and has never, I believe, effected a permanent cure. Next to this method comes incision of the commissures. We might naturally expect such a course to be sufficient to effect the ends desired; and in all probability this would be the case, could we by any means prevent reunion of the edges of our incisions. But this, it would appear from statements of the best authorities, has hitherto been impossible; for, notwithstanding the introduction of tents, leaves of sheet-lead, cerate cloth, etc. between the lips of the wounds, adhesions, more or less complete, are sure to take place."

The instrument which I suggest will, I think, meet indications which the appliances heretofore used have not been able to meet. A tent, or cerate cloth, or strip of easily yielding sheet-lead might not resist the great contractile force existing in these conditions; something fixed and immovable is required. One would not be willing to trust to a less resisting body than the catheter, after urethral section. I do believe that an instrument such as is here figured, if properly constructed and justly employed, will as certainly give a perfect cure as that any indication may be met with a proper remedy at hand. It will be found reliable if there is truth in surgical principles. It might be asked, "What need of such appliances, if Dieffenbach's operation will effect a cure?" Unfortunately, Dieffenbach's manipulations cannot in all cases be carried out. If the mucous membrane, for example, participates in the lesion, the operation cannot be successfully performed. Or who can say that flaps of mucous membrane, however nicely approximated with the skin, will unite? There are several things which may come between the surgeon and success. There are, at least, cases which Dieffenbach's nice operation will not cure.

It seems to me the means suggested will cure them.

The following is an instructive case, reported by Dr. C. A. Hart:

"Mary Grabau, aged ten years, was brought to me by her mother, on May 10th, and presented the following appearance: countenance blanched, body thin and emaciated, the features having a pinched expression, and the buccal orifice contracted to such an extent as to only admit the little finger over the first joint with the employment of an effort. The angles were occupied by dense cicatrices, extending on to the cheeks and chin. The cheeks were also extensively adherent to the superior maxilla. The transverse diameter of the mouth was nine lines.

"The history of the case rendered by the mother was as follows: at the age of three years, the child was attacked by scarlet fever, and during the disease the sloughing of the fauces and cheeks was very extensive, perforations of the cheeks occurring at five different sites. The angles of the mouth were also badly involved. During convalescence, the perforations of the cheeks healed, and the cicatrization of the angles of the mouth closed the orifice to about one-half the normal size. After the recovery of her strength, an operation was desired for the relief of her condition, and performed by Dr. E., of this city; the method being a simple incision from each angle of the mouth, with cold-water dressings applied over the raw surfaces.

"The result of this was of course nil, with the exception that the mouth became even smaller than before, so that it was with difficulty that she could take her food with an ordinary-sized teaspoon. This was followed in the same year by two other operations, whose only results were retrogressions; but what methods were employed it was impossible to discover.

"The impression conveyed upon seeing the case was that much could be attempted, and but little hoped for, though her condition was one to command sympathy and demand an effort for amelioration. Before proceeding to any operation, Dr. G. Ceccarini was called in consultation, and the following method agreed upon, which, with his and Prof. B. I. Raphael's assistance, I performed on May 26th. The patient having been placed upon the table and brought under the influence of chloroform, the little finger was forced into the mouth, to extend the cheek, and a very delicate scalpel passed from the angle of the mouth, horizontally, between the tissues of the lip, to the extent of about three-fourths of an inch; the point of the blade was then carried up, about five lines, by depressing the handle, and then made to cut obliquely into the cavity of the mouth, and, in this position, gradually drawn toward the point of entrance—*thus forming a flap from the inside of the upper lip, lined with mucous membrane.*

"The second step consisted in extending the angles of the mouth about three-fourths of an inch, by incising the skin and other tissues, anterior to the first point of entrance of the knife.

"The above-described procedure was observed upon the opposite side of the mouth, and with much greater ease, as the enlargement of one side afforded more space for manipulation.

"The third step consisted in rolling the flaps which were formed by the first steps on each side of the mouth, over the raw surface of

the new lower lip, from the situations of the old angles to the new ones, and retaining them in situ by several points of silk sutures, *thus bringing two raw surfaces into apposition, and giving a crimson mucous border to the lip.* At no period of the operation was the hemorrhage sufficient to require the aid of a ligature for its arrest, the coronary arteries both having been obliterated, either by the disease or the previous operations. The primary dressing consisted of cloths wet with tepid water, and instructions were given to keep the parts warm to avoid sloughing of the flaps; ordered morphiæ sulph. gr. $\frac{1}{4}$ to be given in about an hour.

"May 27th. Mouth considerably swollen; with high traumatic fever; ordered appropriate remedies.

"May 28th. Fever much decreased; has slept well, appetite good; the edges of the wounds appear to be united.

"May 29th. Condition much improved; has been playing about the room.

"May 30th. The union being thoroughly established, the sutures were all removed.

"May 31st A slight ulceration began on the left side of the mouth, which threatened to destroy the new lip, but fortunately extended into the cheek; this was controlled by the local application of a solution of tannin and glycerin. After this the case progressed favorably to convalescence.

"In the method here reported there is *no loss of substance*, as in the method of M. Dieffenbach, *and a perfect lower lip is formed*, the lower lip presenting about the same appearance as after the method of M. Serre."

Plastic operations about the lips are embraced under the general name of cheiloplasty; those upon the cheeks are termed genioplastic.

The necessity for such operations arises from various causes, not the least frequent of which are sections made by the knife of the surgeon. Reference to plate exhibits five cases; the first resulting from salivation, the second from an ulcer, the third, fourth, and fifth due to operations for the removal of cancer.

The first of these, Fig. 1, is described as having been a shocking deformity. The operation for its relief was performed by Prof. Mütter, the practice being as follows: having first extracted the useless teeth of the upper jaw, which would have prevented the proper adjustment of the flaps, or induced their ulceration, the edges of the ulcer were freshened, and the integuments detached from the side of

the jaw. Two incisions, one above and one below the ulcer, as seen in the figure, were made, so as to form four flaps. These were now allowed to fall together, and were united in the line of the teeth as far forward as the natural angle of the mouth. The result was entirely satisfactory.

In studying this case, the reader will remark that while the mode of section, or making the flaps, most happily meets the indications so far as filling up the seat of the original lost tissue is concerned, yet that this is only done by making two other defects, one above, the other below. Such defects, however, prove, in healthy tissue, of not so much consequence; granulations, quickly springing from the whole circumference of such wounds, supply the lost tissue: indeed, in my own experience I have found, as a rule, that the tendency in these fresh parts is to so rapid a granulation and cicatrization that frequently the line of the artificial union is torn apart.

Fig. 1 may be studied from another stand-point. In a case operated on by myself, very similar to the drawing, where the neighboring tissues were loose and free in character, I succeeded in effecting an admirable cure by simply dissecting the parts from the bone, freshening the edges, and uniting them by the ordinary hare-lip pin, supporting the whole by straps of adhesive plaster passed from beneath the jaw to the side of the head; the parts at first looked very much stretched, but soon accommodated themselves.

Still another mode of performing such operations is after the manner of Taliacotius. Freshening the edges as before, map out, by means of a piece of card-paper, the size of a flap required to fill up the gap; next lay this upon the arm, and, dissecting from the integuments its size, supported by a pedicel, fix it in the break by means of stitches of the interrupted suture. To do this, the arm is to be brought over the head, and thus supported until union is secured, when the pedicel is to be detached, and the parts trimmed to suit.

Subfig. 2, constituting a second study, represents an operation performed by Mott for the relief of an anchylosis of the jaw dependent on cicatrization of the mouth with the restoration of a part of the cheek. 1, exhibits cicatrix arising from an ulcer. This was entirely excised, leaving an opening in the cheek. 2, tongue-shaped flap cut to fill up the opening by being rotated upon its base.

Subfig. 3 represents an operation performed by Prof. Pancoast for the removal of an extensive cancer, and the formation of a new lower lip. The cancer is shown as circumscribed by a curvilinear cut. A vertical incision in the median line of the chin extended from the

curvilinear cut nearly to the os hyoides, and another, which was horizontal and parallel, to the base of the lower jaw, formed four flaps. The angles of the flaps being removed, the upper flaps (1, 2) were raised to the proper level, and united by the twisted suture on the median line, when the lower flaps (3, 4) were also united on the median line so as to cover the front of the chin.

Subfig. 4 represents a similar case, treated by the operation of Chopart. The lines show the idea of the incisions. 2, 4, circumscribe the disease. 1, 5, 3, 6, show vertical cuts. The diseased part, all above 2, 4, being removed, the integuments are loosened from the lower jaw, and simply lifted up, being retained in the new position by hare-lip pins, or other convenient form of suture. This operation occasionally answers very well; in certain instances, however, where, for example, it has been necessary to stretch the parts, much cicatricial evulsion is apt to occur.

Subfig. 5 represents the same position of the disease, treated after the manner of Lallemand. 1, the remaining portion of the lip, which is to be drawn over to the angle of the mouth at 2. A flap, formed of the integuments of the neck, having been dissected off, is shown as being partially rotated on its base, and about to be carried up to cover the deficiency. The wound on the neck may either be approximated at its edges, or left to heal by granulation.

In epithelial cancers quite as large as those represented in Figs. 3 and 4, I have succeeded in securing the most perfect cures by practicing the operation of Malgaigne. This consists in removing the diseased mass by a simple V-incision; the angles of the mouth are next enlarged by horizontal cuts, and the V drawn together and united in the middle line of the face. In my own cases I have always placed a pin at each corner of the mouth; as the result of this, some little puckering is produced, but, in return, it eases the strain on the middle line, and itself disappears after a very few months.

Plate XI. is one of the most valuable presented by Professor Smith in his System of Surgery, representing a combined operation in rhino-cheiloplasty, with the original appearance of the patient, the steps of an operation devised and executed by Professor Pancoast, and the result obtained as exhibited by an accurate likeness of the patient taken sixteen months after the operation.

History of the Case.—The history of this case, which will serve as a type and study of similar cases, is thus described by Professor Smith. "A man aged fifty-three had lost all the soft parts of the nose and whole of the upper lip, from the commissures of the mouth to the

PLATE XI.

RHINOPLASTIC AND CHEILOPLASTIC OPERATIONS.

Fig. 1.—Appearance of patient prior to the operations of Cheiloplasty and Rhinoplasty.—*After Pancoast.*

Fig. 2.—View of his face with the chin depressed. The mouth, being contracted into a rigid orifice, was enlarged laterally by the stomatoplastic operation of Dieffenbach for atresia oris, after which two flaps were made, as marked in the lines upon the cheeks, so as to form the upper lip.—*After Pancoast.*

Fig. 3.—Appearance of his face after this operation, showing the position of the sutures and the improvement in the mouth.—*After Pancoast.*

Fig. 4.—Shows the steps of the Rhinoplastic operation performed upon him subsequently. The edges of the nasal cavity being freshened by a grooved incision, the outline of the new nose was marked on the forehead before cutting the flap. The dots indicate the position of the sutures.—*After Pancoast.*

Fig. 5.—The wound in the forehead being closed by the hare-lip sutures, the flap was reverted, and attached in the groove on the edge of the nasal cavity by three stitches of the interrupted suture, which were tied over little rolls of adhesive plaster, after Græfe's method. The edge of the septum is also attached to the upper lip. The twist in the pedicel is seen in the root of the nose.—*After Pancoast.*

Fig. 6.—An accurate likeness of patient, sixteen months after the operation.—*After Pancoast.*

canine fossa of each side, as well as the septum narium and the turbinated bones, the cavities of the antra Highmorianum and of the sphenoidal sinuses being exposed. His appearance with his mouth closed is shown in Fig. 1. The mouth, when opened, presented a rigid circular orifice three-fourths of an inch in diameter.

"Operation of Pancoast.—The mouth being widened after Dieffenbach's method (see description on previous page), the free surface of the gum was freshened, and an incision was then made obliquely upward and outward for a quarter of an inch from the point where the gum was covered by integuments, and from the end of this another cut was made for about the same distance, nearly parallel with the incisions for widening the mouth, but inclined a little downward. The cheeks being now loosened from the gum and malar bone by incisions on the side of the mouth, the flap of skin and subcutaneous fatty matter was raised from the surface of the muscle by beginning the dissection at the angle next the nose, Plate XI. Fig. 2.

"The arterial branches, which were divided, having been twisted, the flaps were drawn downward and forward over the raw surface of the gum and fastened together with the hare-lip suture, Plate XI. Fig. 3, the inner edge of the rotated flaps being thus united in the middle line of the lip. The face being then dressed with lint wet with lead-water and laudanum, the patient recovered in about two months. The nose was subsequently formed as follows:

"The hair being shaved from the temple and forehead, the nasal orifices closed with lint to prevent the entrance of blood, and the patient lying down with the head supported by a pillow, a flap was raised from the forehead, as shown in Plate XI. Fig. 4, the skin being divided at a single sweep of the knife, the blade of which was inclined outward so as to cut a beveled edge. The apex of the flap, which was about five-eighths of an inch wide, rested between the eyebrows, and the tongue-like portion which was to form the columna nasi extended up into the scalp. The base of the flap was nearly three inches wide, in order to allow for its subsequent contraction. The flap, after being dissected up, was then turned down on the left side and wrapped in linen, while the wound in the forehead was closed by four interrupted sutures, after which the flap was applied to the freshened edges of the new lip and gums, the whole being held in position by the plastic suture before described, and tied over rolls of adhesive plaster, as in Græfe's method, Plate XI. Fig. 5. Union having occurred, the pedicel of the flap was divided, five

weeks subsequently, by passing a director under it, after which it was smoothly fitted down to the roots of the ossa nasi, in a cavity which was made for its reception by excising a portion of the subjacent integuments. By the twelfth day union was perfect, and the patient left the hospital so much improved that, sixteen months subsequently, his likeness was taken, as represented on Plate XI. Fig. 6."

CHAPTER XXXVII.

THE TONGUE AND ITS DISEASES.

Whether from infrequency of disease in this organ, or the difficulty of expressing its pathological phenomena, we find very little which might be called systematic, that has been written upon the subject.

Of medical diseases the tongue has long been esteemed a reliable sentinel: hence, many and varied are its functional derangements and expressions. To term, however, such derangements disease could not by any means be proper, the sympathetic relationship being evident to the most superficial of observers.

Of organic, or surgical diseases, the tongue has seemed to me to have its full share. These diseases are of a twofold relation: local, as reference is had to some direct cause demanding only local attention; indirect, as constitutional offense is the agent against which a treatment is to be directed.

Of local injuries, we may refer to ulcers caused by jagged and projecting teeth-roots, to cuts and contusions from falls and blows, to bites inflicted under various circumstances by the teeth, to papular hypertrophies, to epithelial indurations and ulcerations, to stings from insects in fruit-season, to burns, scalds, the incautious or accidental mastication of acrid or irritating substances, to glossitis, from the excessive use of tobacco, from operations performed on neighboring parts, from mustard administered in strength, in necessity for sudden emesis, etc.

Of associate or constitutional diseases, we may mention prominently the syphilitic and mercurial impressions appearing in the form of acute or chronic inflammations, indurations, fissures, ulcers, and cysts. Malignant diseases, particularly scirrhus, have here also not unfrequently a first expression.

"In drawing inferences," says Dr. Wood, "from the condition of this organ, it is important to know whether the appearances it may present are the result of local disease in the mouth, or of the sympathies which connect it with other parts of the system. In general,

there is little difficulty in coming to a correct conclusion upon this point: it is only necessary that the attention should be directed toward it. This organ," continues Professor Wood, "seems to have been designed as an index, to the eye as well as to the ear, of the state of the system; so numerous and diversified are the morbid affections which modify its healthy appearance. It not only participates in all general derangements of the whole system, serving as one of the surest guides to a correct judgment in relation to the degree, progress, and precise stage of the disease, but especially also sympathizes with the different parts of the digestive tube, at one extremity of which it is placed.

"The *bulk* of the tongue may be increased or diminished. Its enlargement, when not so considerable as to be very obvious, may often be known by the appearance of indentations on its sides, made by the pressure of the teeth. This is occasionally one of the first signs of the mercurial influence. Its contraction, when not the mere effect of dryness, is usually the result of a diminished supply of blood, and indicates either a general deficiency of the circulating fluid, or great feebleness of the heart's action. Like every other part naturally moist, it shrinks by drying; and, under such circumstances, no general inference can be deduced from its mere loss of volume.

"Its *color* is often greatly and significantly modified. Morbid floridness of the tongue is the consequence either of the condition of the blood, or of its greater abundance in the organ. In the former case, an unduly arterialized state of the mass of the blood is indicated; in the latter, either overexcitement of the circulation generally, or phlogosis of the stomach. Redness of the tongue, not the result of local causes exclusively, has been supposed by some pathologists to be an almost certain sign of gastric inflammation or irritation. But this is far from being the case. It is often seen when no evidence of gastritis is presented, either by the symptoms or upon dissection, and is not unfrequently absent when that disease exists. Serious practical injury may result from this error. The red tongue can be considered as having special reference to the stomach, only when other symptoms point in the same direction, and, even then, is by no means a certain sign. A *livid* or *purple* color of the tongue is usually dependent upon an insufficient aeration of the blood, and is a valuable sign, in connection with the same color of the lips. Not unfrequently the tongue is morbidly *pale:* and this state is a sign of deficiency of the blood in general, or of its red cor-

muscles in particular, or of great prostration of the circulating forces.

"Its condition as to *dryness* and *moisture* is often highly significant. But caution is necessary not to mistake dryness, from temporary and unimportant causes, for that which results from general disease. In persons who sleep habitually with their mouths open, the tongue is apt to be dry in the morning; and the same cause often produces the same effect in sickness. On visiting a patient, we find the tongue unexpectedly dry, and begin to feel some apprehension, until we learn that the patient has been breathing for some time through the mouth alone. A stoppage of the nostrils often gives rise to this phenomenon. In all doubtful cases, it is only necessary to request the patient to close his mouth, and then move the tongue about so as to moisten it. If he succeed satisfactorily, we may conclude that the dryness was accidental, and of no account. Another caution is requisite; to take care, namely, that a really dry tongue should not be mistaken for a moist one, in consequence of the patient having recently taken a liquid into his mouth. Dryness may exist in different degrees, from mere clamminess to perfect aridity. It depends on a deficiency of saliva, or of mucus, or both, and indicates a general tendency to diminished secretion. It not unfrequently occurs, as a sympathetic affection, in ulcerative inflammation of the small intestine. It affords sometimes the most important therapeutical indications.

"The *temperature* of the tongue serves as a guide to that of the body generally. When cold, it evinces, for the most part, great prostration of the powers of life. It proves that the process of calorification is failing at the very fountain; for the breath must be cool before the tongue can become so in any considerable degree. This coldness of the tongue has been frequently noticed in severe cases of epidemic cholera. But we must take care not to confound coolness from local causes, as from ice in the mouth, or from the patient having slept long with the mouth open in a cold atmosphere, with that proceeding from the state of the system. Heat of the tongue, except when arising from inflammation of the organ, may be considered as a sign of a general elevation of temperature.

"But the condition usually denominated a *furred tongue* is, perhaps, the most valuable diagnostic symptom afforded by that very important little member. In this state, the tongue is covered with a morbid coating, which adheres so firmly that it cannot be removed without removing a portion of the surface along with it. Occasion-

ally, deposits take place from the saliva and the mucus of the mouth; but these are easily removable, and must be distinguished from the genuine fur. The latter proceeds from a secretory process of the tongue itself, and seems to be incorporated with the superficial layer of epithelium. It is almost always confined to the upper surface, where the structure of the membrane is papillary. Though very generally a sign of disease, it is not always so. Some persons have a furred tongue habitually, more especially upon rising in the morning; and, though in the greater number of these there is probably some chronic disorder of digestion, yet in others the health appears to be perfect.

"A furred tongue almost always accompanies fever, and is one of the most decided characteristics of that affection. Indeed, when considerable in degree, and not dependent upon stomatitis of any kind, it may very generally be regarded as a febrile symptom. When the fur is *white, thickish, tolerably uniform,* and accompanied with moisture, it usually indicates an open, active state of fever, in which, though the obvious symptoms may possibly be violent, there is not apt to be any lurking mischief, nor any malignant tendency. When *short,* very *adhesive,* and *rather scanty,* permitting the redness of the tongue to appear through it, and attended with some disposition to dryness, it is often a sign of a protracted and obstinate form of fever, which is apt to assume a low, nervous, or typhoid form. A *yellowish hue* of the fur is usually indicative of bilious disorder, being produced either by the vomiting of bile, or, what is probably much more frequent, by direct secretion from the tongue, consequent upon deficient secretion by the liver, or an excessive production of bilious matter in the blood. Not unfrequently, this color of the tongue is accompanied with a bitter taste. It is common in miasmatic fevers and hepatic diseases. A *brown or black tongue* is usually indicative of a low state of the system and an impaired condition of the blood. It is owing to the secretion of a dark matter, apparently identical with that which collects about the teeth and lips in typhous fevers, and probably consisting of blood modified in its passage out of the vessels. The same action would seem to take place in the tongue as that which, in the stomach and bowels, occasions the black discharges so common in malignant fevers. It may depend on an enfeebled state of the secreting tissue, or a diseased state of the blood, or on both united. Very frequently this darkness of the tongue supervenes upon a previously white coating, and indicates a deteriorated state of the vital forces and probably of the

blood. The caution should be observed, not to confound this discoloration with that which may proceed from accidental causes, as from the chewing of liquorice, tobacco, burnt coffee-grains, etc. In many instances, the white fur of the tongue is modified by *red points*, which are the tops of the swollen and projecting papillæ. This appearance is not uncommon in eruptive febrile diseases, especially scarlet fever and measles. When consequent upon a dyspeptic state of the stomach, the fur is most copious in the morning before breakfast. In some persons, emptiness of the stomach is said always to induce this state of the tongue.

"The manner in which a furred tongue becomes clean affords valuable indications. When the fur slowly recedes from the tip and edges, thinning gradually as it retires, it intimates a favorable convalescence. A portion of fur often lingers near the root of the tongue, long after the disease has given way. In another mode of cleaning, the fur loosens and separates in flakes, often beginning at the middle or near the root, sometimes in large patches, or over almost the whole tongue at once, leaving a smooth, red, glossy surface, as though the papillary structure had been lost. In such cases, if acute, and if the tongue remains moist, convalescence almost always takes place, though usually tedious, and sometimes very lingering. In threatening fevers, it is very desirable to witness this phenomenon; and, as it is often preceded by a feeling of soreness in the fauces, this may be considered, when it occurs in such cases, as an auspicious circumstance. Much stress was laid upon this as a prognostic symptom by the late Dr. Joseph Parrish, of Philadelphia. Sometimes the fur recurs once and again, before it ultimately disappears; and weeks and even months are occasionally consumed in the struggling and apparently uncertain advance of the system toward health. In less favorable cases, the tongue, after having commenced the process of cleaning, as just described, or even after completing it, instead of continuing moist, becomes as dry as a chip, with an aggravation of all the symptoms, and no little increase of danger. The indication is still more unfavorable when, in addition to its dryness, the surface becomes gashed, chapped, or fissured, or exhibits a rough, scaly appearance.

"This smooth, red, and glossy state of the tongue, sometimes with moisture and sometimes with dryness, is not uncommon in chronic diseases, in which it is generally a bad sign, and is supposed to indicate serious organic derangement of the alimentary mucous membrane. A still worse condition, however, is an aphthous state of

the tongue, which is apt to come on in the advanced stages of chronic diseases, and is generally to be received, under these circumstances, as a fatal sign, though of itself, and occurring in ordinary health, it is in no degree alarming.

"A *loss* or *depravation* of *taste* is not uncommon, and is generally of little consequence, depending upon a mere derangement of the surface which receives the gustatory impressions. But when of a paralytic nature it is much more serious, as it generally indicates disease within the encephalon.

"The only other point requiring consideration refers to the *movements* of the tongue. When, in acute febrile diseases, these are not under the control of the patient, when upon being requested to protrude his tongue he is unable to do so, or when the organ trembles much in the attempt, the symptom is exceedingly unfavorable, indicating either great prostration, or dangerous cerebral disease. Of similar unfavorable prognostication, under the same circumstances, is the occurrence of a difficult and hesitating utterance, like stammering. The inclination of the tongue towards one side, when protruded, usually indicates palsy, and is one of the common attendants upon hemiplegia."

With these almost exhaustive observations by Professor Wood are to be associated and noticed the facts that in some nervous, irritable persons the tongue is found habitually furred, yet without any symptoms of gastric or other derangements. Some persons get furred tongue the moment their stomachs are empty; others have their tongues coated always after a meal and while digestion is going on, the coating passing away as the function ceases. Mental and moral emotions have a most decided influence. Dr. Wright, in one of his clinical lectures, mentions the following striking illustration:

"In calling upon a certain patient," says this gentleman, "the first thing I did was to look at his tongue. I found it as usual, very pale, flabby, and moist, but without any coating. After having made other necessary inquiries, I was informed by my patient that his heart, which had long been disturbed by mental emotions, had on the previous evening beat with unusual violence and irregularity. On my asking if he could account for it, he told me that he had just then received the distressing intelligence that an uncle from whom he expected a competency, had not left him a shilling. This pitiable tale, told with much earnestness and visible feeling, occupied little more than twenty minutes. At the end of that time I again looked at his tongue, and found it coated with a thick, white fur."

It is, however, not with functional expressions of the organ, but with diseases localized in it, that the surgeon has to treat. These diseases, by the review made of sympathetic disorders, we are now prepared to consider.

The most frequent disease of the tongue with which I have met is syphilis. Syphilitic ulcers, the most common of the manifestations, appear on any part of the organ, but are most common to the sides and under surface. Such ulcers are, in my experience, invariably accompanied by associations of its origin,—psoriasis on the body, nodes, falling of the hair, lymphatic induration of the posterior cervical ganglia. A syphilitic ulcer on the tongue has the appearance of chancre, hard or soft: we meet with them where the ulceration is quite deep and the edges heavily indurated. Again, where there is neither excavation nor induration, we know, however, that they are venereal from the associations.

A second form of syphilitic disease of the tongue is observed in the induration and hypertrophy of circumscribed patches of mucous membrane. The induration in these cases is so markedly localized, that, if it were not for their varying locations,—being always, however, on the dorsum,—one might readily believe them to be enlarged circumvallate papillæ; the patches are quite as large as a dime piece, are elevated, and are as isolated as one sees a fungiform wart. I have seen two such patches on the dorsum of a tongue, and at the same time a large ulcer on its under surface.

Cracks and fissures are other syphilitic indications met with on the tongue. It may happen in some instances that these fissures are so deep as to seem to divide the organ into a number of parts; they always, so far as I have observed, run lengthwise. These fissures are at times unbearably sore, denying the patient comfort either in eating or in rest.

Indurations of the mucous membrane of the sides of the tongue are occasionally observed, or it may be that a general thickening exists, or, indeed, that the whole organ is indurated. In this latter condition the disease has sometimes been mistaken for cancer; but such an error could arise only from a failure to observe the associations of the case.

Sometimes the dorsum presents red patches, the result, evidently, of a loss of the epithelial covering. These patches are perfectly smooth, not ulcerated, but are painfully sensitive to hot or cold impressions. I have met with this condition where the dorsum seemed literally skinned.

The treatment of syphilis in the tongue has, with one special exception, the twofold signification of constitutional and local,—the exception being that of chancre. It has without doubt occurred that a man has gotten a chancre upon his tongue. Mercury, in some of its various forms, seems to be looked upon by most practitioners as having in this direction something specific in its nature; without doubt, however, it is a greatly abused medicine, and should be used with more caution and judgment than generally characterize its exhibition.

Where ulcers or other manifestations upon the tongue are secondary in their signification, and mercury has not been used upon the case, it is marvelous how at times, under its influence, such manifestations can be made to disappear. How this medicine is to be used is perhaps best left to be directed by the apparent requirements of individual cases. Of one thing, however, I am sure: its best effects are not to be obtained by salivating the patient. Mercury in the form of the bichloride is a favorite prescription; it may be given in doses of from the tenth to the twentieth of a grain dissolved in water or the fluid extract of sarsaparilla, three times a day. The hyd. c. creta, combined with Dover's powder, is a combination which may be used with benefit where dryness and other lack of function are found in the skin. Impression by inunction is another mode of exhibiting the medicine. A lump of mercurial ointment, the size of a large pea, may be rubbed into the inner face of the thighs night and morning. Calomel in quarter-grain doses, combined with small quantities of sugar to render it palatable, may be given every two or three hours, until the patient remarks the coppery taste. Blue pill, in five-grain doses, answers very well if there is no hepatic disturbance, as manifested by gastric derangement and sick-headache.

Of the various mercurial preparations, I think, however, the preference will be found to reside with the bichloride: in this form the impression of the medicine is gradually secured. If necessary, it may be given continuously for a month.

Combined with the mercurials, it has been my experience that tonics are generally found indicated,—a something to counteract the degenerative tendency which appears to reside in every dose of a mercurial administered. Iron, quinine, gentian, and bark are excellent preparations. A prescription which will be found to be a very good one is as follows:

R.—Hydrarg. bichl. gr. iv;
Elx. ferri cinch. ℥vi. M.
Sig. A teaspoonful three times a day.

A second, admirable in cases associated with nervous disturbance, is the combination with the mercurial of the pyrophosphate of iron:

R.—Hydrarg. bichl. gr. iv;
Syrupus ferri pyrophos. ℥vi. M.
Sig. A teaspoonful three times a day.

In syphilitic diseases of the tongue, tertiary in its type, mercury will seldom be found admissible. The system is broken down: the process of cure must be one of regenerative repair. These are the patients for the sea-shore and the hill-side. You will not get them well if you cannot build them up.

Conjoined with the tonic medication of these cases, very experienced authorities commend the use of the iodide of potassium. Where it is thought desirable to use this medicine, ten grains as a dose may be given three times a day. It is most conveniently exhibited in water, or, if taste is consulted, in the fluid ext. of sarsaparilla.

Tertiary symptoms, M. Ricord observes, will not inevitably occur in the course of syphilis, but they are very likely to do so if the treatment of the primary and secondary symptoms be not conducted with the greatest care. As soon as ever the tertiary period has set in, mercury must be abandoned, and iodide of potassium given. Nay, further, as mercury taken in time may prevent or retard secondary symptoms, and so may be regarded as a prophylactic against them, so may iodide of potassium be regarded as a prophylactic against tertiary symptoms; and therefore M. Ricord observes:

"To render the treatment of secondary syphilis complete and rational, it should always be followed by the exhibition of iodide of potassium. This substance is, however, not only useless when employed against secondary symptoms and those of transition, but very often hurtful; yet, when secondaries have been of long standing, it may produce beneficial effects; it is also useful as an adjuvant of mercury in those affections which in some degree lie between the secondary and strictly tertiary manifestations; and, finally, it is indispensable for combating the symptoms of a decided tertiary nature. In order to become well acquainted with the proper manner of administering the iodide of potassium, we should take the trouble of

studying its effects, independently of its curative action. First let us see how it acts on the skin. It may produce on the cutaneous surface diverse psydracious and acnoid eruptions. The pustules are generally surrounded by a vividly red areola, and the usual seat of these eruptions is *below* the umbilical region, as the nates, thighs, etc., whereas the common acne (not to mention its other characters) is mostly situated in the upper half of the body. To these peculiarities, it may be added that the pustules will fall in immediately the administration of the iodide is interrupted. Exanthemata, impetigo, and lichen are very apt to be produced by the use of this salt; and what you ought especially to keep in mind is, that ecchymosis, and purpura in the inferior extremities, are sometimes caused by the action of the iodide of potassium. The effects of the latter on mucous membranes should also be carefully observed. It may cause inflammation of the conjunctiva, the submucous cellular tissue lying under which gets then infiltrated and puffed up; the eyelids turn red and œdematous, and, when the inflammation and effusion are not arrested, the internal parts of the eye become involved in the affection, and photophobia is the result of this state of things. The normal mucous secretion is always a little increased, but it does not take the muco-purulent character, as in the case of catarrhal ophthalmia. Coryza, of a more or less severe nature, often exists at the same time; it is preceded and accompanied by headache, and a pretty abundant mucous secretion; but this coryza never reaches the suppurative state; it never produces more than a catarrho-serous flux. These affections never give rise to any fever, and they disappear as soon as the iodide is given up. This coryza is an accident which we should not overlook; for it is of importance to avoid it when we have to treat a tertiary affection of the nasal fossæ. As for the effect of the iodide on the intestinal canal, I have to state that persons enjoying good health can bear very large doses of it; I have given as much as fifteen drachms a day. M. Puche has often given ten drachms per diem, after commencing with six; and it has been noticed that it improves the appetite of the persons who use it. With some patients a certain pleurodynic sensation, corresponding to the cardiac extremity of the stomach, is felt after its ingestion; but it never causes vomiting. The submucous cellular tissue of the stomach may, by the use of this iodide, undergo the same modifications which we have noticed the conjunctiva to be subject to,—a sort of hyper-secretion and intestinal ptyalism takes place, and much of the fluid which ought to have been secreted by the skin is rejected

by the mouth. This liquid has a slight taste of iodine; it is not fetid in the least; the gums are not swollen, and there is no fetor in the breath, as happens in mercurial ptyalism. The same effect may be produced on the other portions of the intestinal canal; the patients are then seized with abundant serous diarrhœa. The iodine is eliminated from the system by the kidneys; half an hour after the ingestion of it, its presence may be ascertained in the urine, and it should be remembered that the presence of iodine in the blood increases the renal secretion. I have even observed a case of polydipsia which went on as long as the iodide was used, but disappeared when the latter was discontinued, and gradually sprang up again as the use of the salt was resumed.

"The effects of the iodide of potassium on the circulation are of a sedative kind; it diminishes the number of arterial pulsations, and lowers their force, but they may regain their normal standard if the remedy act beneficially on the system; the same arterial energy may also reappear when the iodide causes a slight phlegmasia. This salt is somewhat antiplastic; for it has rather a tendency to liquefy the blood, and may even produce the peculiar hemorrhages of purpura. When the effect of the iodide on the nervous system is carefully watched, it is found to cause a certain excitement of the nervous centers, followed by a little uncertainty in the movements and in the intelligence."

A combination much employed by Sir Astley Cooper, in cases where the iodide of potassium seemed not to favor the patient, was the liquor arsenici et hydrargyri hydriodatis,—Donovan's solution.

Concerning the local treatment of the venereal affections of the tongue, with which, in a work like this, we would seem to have most to do, little is to be added outside of the suggestions offered on other pages. The treatment is constitutional: direct medication is perhaps simply to be esteemed as palliative. Lactuca sativa five ounces, honey one ounce and a half, and alum one drachm and a half, is a favorite gargle with Ricord in all these cases.

Another consists of a decoction of hemlock, six ounces and a half, to bichloride of mercury, three grains. From my own experience, I have suggested the use of acids applied to the ulcers in cases where the dyscrasis has been corrected or nearly so. It is surprising with what rapidity a syphilitic ulcer will respond to almost any of the mineral acids.

In a bad case of mucous tubercles I once treated, I got my patient well by daily salt-baths and the local use of quinia and iron; twenty-

five grains of the former to two drachms of the muriated tincture. The tubercles were painted twice each day for two months.

Borax is a soothing application; it may be rubbed with water into a cream, and thus be applied ad lib.

A species of local specific, to be used on the part and rinsed away after a few moments, is compounded as follows:

℞.—Aqua destillat. ℥ixss;
Ferri perchl.
Acid. citric.
Acid. hydrochloric. āā ℥i. M.

This may be repeated three or four times in the day.

Fissures and fistulæ are sometimes, in their chronic form, cauterized, nitric acid, pure or dilute, being used for the purpose. In a case of long-standing fissure of the tongue, I on one occasion cut out the induration, the patient making a rapid recovery.

Chloride of zinc, twenty grains to the ounce of water, will be found a useful application in chronic syphilitic conditions, whether of ulcer, fistule, or fissure.

Mercurial enlargement and induration of the tongue is a condition frequently demanding treatment. One of the first effects of this medicine is often seen in the markings made upon the sides of this organ by an otherwise not observed swelling which has crowded it against the teeth. The tongue tumefied by the impressions of calomel may become so enlarged as to fill the whole mouth. One particular case I recall, where, to prevent the patient from being smothered, I was compelled to drag the body forward over the lower jaw, and thus fix it until relief could be otherwise secured.

Mercurial ulceration of the tongue is another of the offenses of this medicine. Such ulcerations are in appearance indolent and irritable, are associated with similar conditions of the gums, and with salivation: their diagnosis is very plainly marked.

The rational treatment of the mercurial conditions refers to the correction of the local impressions, together with elimination, and support applied to the system at large. In rapid swellings of the tongue, it may be found necessary to resort to the use of leeches, combined with most marked derivation. In the case above referred to, forty common leeches were applied to the throat, the patient was profusely sweated, and these applications were succeeded by a saline cathartic.

Such treatment, combined, if the circulation is sthenic, with some

arterial depressant, as digitalis, aconite, or veratrum, will commonly relieve from the immediate danger. Unless, however, the ptyalism has been acutely excited, and the subject is strong and vigorous, this treatment will be succeeded by great lassitude and depression; such depression is, however, a necessity, and has perhaps saved the life.

A local treatment in cases of this kind is simply palliative and soothing. The lactuca sativa and honey, recommended in the syphilitic sore-mouth, is an excellent gargle. Sage tea, combined to a full saturation with chlorate of potassa, is another agreeable application. Common table-tea is very grateful to a patient. In combination with these, or any similar demulcent gargle, I have found that great relief has been derived from the free exhibition, internally, of the bromide of potassium.

℞.—Potass. brom. ʒss;
Aqua, ℥viij. M.

Sig. Tablespoonful repeated occasionally as the patient is nervous. Twenty grains, as here directed, may be prescribed three times a day at the least. I have given eighty at a single dose.

The acute conditions of a mercurial glossitis combated, the practitioner may find it desirable to attend to the more general requirements of the case. The system is to be protected against further impressions of the agent, while at the same time it will generally be found that a present support is demanded. Chlorate of potassa, the antagonist of the mercurials, has now obtained in this direction an almost universal use: it may be administered in full saturation, in tablespoonful doses, three or four times a day. A very good way to prescribe this salt is to order one ounce placed in an eight-ounce bottle, which is to be kept filled with water until all is dissolved. As each dose is taken, the patient replaces it with fresh water.

In the treatment of the mercurial ulcer, the local applications suggested have been various. Bismuth, red bark and borax, in equal proportions, act sometimes very happily. Chlorate of potassa, tannic acid, and glycerin is another excellent combination. Solutions of sulphate of copper or zinc, one grain to the ounce of water, are cleansing and stimulating applications. Iron, opium, chalk-powder, aromatic powder, are all, in their turn and place, useful. If phagedena intervene or threaten, the potassio-tartrate of iron, as recommended by Ricord in the similar ulcers of syphilis, is not to

be omitted: it may be used in the strength of thirty grains to the ounce. It should also be administered internally in doses varying from five to ten grains repeated every two hours.

Chronic phagedena, which in some degree associates itself more or less frequently with mercurial ulcers, is best treated by the potential cauterants. Of these, a favorite is creasote: it is to be applied with care, however, as it may provoke secondary inflammation. Carbolic acid is a useful article, and will sometimes prove very reliable. Nitric acid is highly recommended by many practitioners: when applied, every recess of the sore should be burned, and this should be repeated daily until healthy granulations are provoked.

Scirrhus.—Of the third form of constitutional impressions, scirrhous carcinoma may now engage our consideration. This scirrhus of the tongue, from the circumstances of its association and position, is to be assumed a necessarily dangerous, if not fatal, disease. Scirrhus in other parts may be cured; that is to say, being removed, it may not reappear in the part of removal,—although, being, as is most likely, a constitutional condition, it is perhaps seldom that the disease is permanently destroyed. That scirrhous carcinoma is not, however, at least in its incipiency, so formidable a condition as encephaloid, seems to be the universal impression: there is a fixedness, an apparent isolation, about it, which always invites operation.

Situated in the tongue, such isolation is, unfortunately, not so marked as when found in other parts: it appears as an induration rather than as what might be termed a lump, and this induration has not commonly a definite boundary to its stroma: hence, if removed by operation, one is at a loss to say whether such removal is complete.

A carcinomatous scirrhus is to be distinguished from ordinary scirrhus principally by the peculiar darting, lancinating pains which, sooner or later, always appear in it; these pains are markedly diagnostic. Again, a scirrhous carcinoma is apt to have a hereditary history: a generation may have escaped, but it will be discovered somewhere in the family. In this respect, my experience leads me to infer that it is really a more persistent type of carcinoma than encephaloma. Encephaloma is more quickly fatal, but is less persistent.

All local medication to a carcinomatous scirrhus is worse than useless. If it is not widely cut away, it is better, a hundred times, to

do nothing at all to it. Many a tumor of this class that would have remained dormant for years has been excited to the most destructive malignancy by overofficious meddling with it. If a practitioner does not know the character of a tumefaction upon a tongue, he cannot act more wisely than to do nothing at all, until, at least, time and continued observation have made plain to him the diagnosis.

At a period very various as to time, a scirrhous carcinoma ulcerates. If the tumor has attained any size, fungous granulations sprout forth, giving that expression known as fungus hæmatodes; if, on the contrary, the tumor ulcerates while small, it is irregular, puckered, everted in its edges or elevated, and covered with abundant granulations: the discharge may be thin and sanious, or purulent, the latter character being, however, rare: it differs from the syphilitic sore in its granulative bottom.

A section of scirrhous carcinoma presents a stroma dense, abundant, and closely meshed. A fibrous structure is always more or less marked, particularly in its occult state, such structure assimilating both the white and yellow tissues, being perhaps really these tissues. A diagnostic sign is a peculiar creak or cry given under the knife. Another is a shrinkage or contraction in the center of a section. Still another is a creamy juice, which may often be scraped from it.

In looking at a microscopic slice of scirrhous carcinoma, the

Fig. 104.

A microscopic view of the cancer-cells filling the interstices among the bundles of the fibro-cellular tissue in the skin of the breast. Magnified about two hundred times. (After Paget.)

areolæ existing in the stroma are found filled with granules, nuclei, and nucleated cells, these cells being of most diversified form, and

common to no tissue: the term heteroclitic is justly applied to them. The appearance of such a section is exhibited in the engraving, Fig. 104.

"It is well known that whenever a special predisposition to abnormal action exists in the vital economy, a very slight thing is sufficient to act as an exciting cause of disease. This is especially the case in many affections of both an organic and dynamic character, examples of which we have occasionally presented, among which was the apparent development of cancer from the irritation produced by rough or decayed teeth. Additional evidence upon this point is furnished by the following cases from the clinical report on epithelial cancer, by Mr. Jonathan Hutchinson, in the *Medical Times and Gazette:* 'George P., aged thirty-six, a dark, sallow, but healthy-looking man, was admitted, December 29, 1853, into St. Bartholomew's Hospital, under the care of Mr. Stanley, for a cancerous ulcer in the middle of the right margin of the tongue, about an inch in length, half an inch in width, and half a line to a line in depth. The base was irregular, not granular, nor distinctly nodular or warty; it was clean and moderately florid, and while in the hospital, and being guarded from the teeth by an ivory cover for them, it became level, and skinned over very thinly, yet enough to prevent its bleeding when lightly rubbed. The borders of the ulcer were upraised, with a somewhat lobed or glandular surface. This was especially the case with the upper border, which, occupying a portion of the dorsum of the tongue, overhung a little the adjacent mucous membrane. The elevated border felt firm, tense, and nearly hard; the base of the ulcer was equally so, and these characters were evidently derived from morbid deposits at and for about two to three lines beyond the ulcerated surface. At the border this deposit did not involve the very surface layer of the mucous membrane, which was tensely stretched over it, but discernible with its small vessels. The rest of the tongue appeared to be all healthy. One lymph-gland by the side of the facial artery was slightly enlarged, firm, but not hard. The teeth by the side of the ulcer were not rough, but neither were they clean, and, as already said, the ulcer became smoother and skinned over when protected from them.

"'He said that nine months previously his tongue had become sore through the "fretting" of a decayed tooth at this part. He allowed the tooth to remain for six months, the sore extending all the time until it had reached its present dimensions. At length, three months ago, the tooth was drawn; the sore remained, and he

was not aware of any change in its character. It was always very painful, and the pain extended from it over the whole cheek and the side of the head and jaw. Many of the cervical lymphatic glands under the right side of the jaw had been enlarged, but they had subsided two months previously; and the one by the facial artery had only in the last week been enlarged. His great-aunt died of cancer of the throat (sufficiently proved); but no other relative was known to have had cancer. He never had any syphilis or well-marked struma.'

"After an ineffectual effort to remove the disease by constitutional treatment with iodide of potassium, the part was excised, the troublesome symptoms subsided, the patient recovered, and is still in good health,—eleven years after the operation.

"'Caroline C., aged thirty-five, a married woman, and the mother of three children, was admitted, February, 1855, into Middlesex Hospital, under the care of Mr. De Morgan. She was subject to dyspepsia; but during the last few years she had been in rather better health. She had broken teeth on the right side of her mouth, which had irritated the tongue. Two years before her admission she noticed that her tongue was sore, and a year ago a lump began to form in it. Mr. De Morgan removed the right side and tip of the tongue by ligature. He made an incision in the median line beneath the jaw, and dissected his way upward, and then, having passed the ligature, tied it over a wooden bridge, which was fixed as a sort of tourniquet. In ten days or a fortnight it had separated. On March 19th both the wound below the jaw and that of the tongue were quite healed. There was then, however, suspicious hardening about the cicatrix. The disease soon afterward returned in the stump, and in the course of a few months the woman died.'

"'Daniel H., aged forty-six, was admitted, November 2d, 1860, into St. Thomas's Hospital, under the care of Mr. McMurdo. He stated that twelve months ago he experienced a soreness of his tongue on the left side, which he imagined was due to irritation of some decayed teeth. Several had been removed in consequence, but nothing was done for the tongue. The ulcer in the latter grew more painful, and five months ago the glands below the jaw began to enlarge. There is at present an ulcer on the left and under side of the tongue. This half of the tongue is hardened, swollen, and very painful; and he speaks with great difficulty, from pain in moving the tongue, which is also not able to be much moved, from being swollen, and tied down by the ulceration and induration. He suf-

fers a great deal of pain. His health has generally been good, and he says that, except for the local distress, he feels well. He is, however, very sallow, haggard, and emaciated.' "

Purely benign localized tumors of the sarcomatous class, as the fibrous, the fibro-plastic, and the cartilaginous, are those with which scirrhous carcinoma is most apt to be confounded.

As scirrhous carcinoma always begins upon the sides of the tongue, jagged and sharp teeth irritating the parts may be supposed to have some influence in its localization; such teeth, under all circumstances, should be removed or smoothly dressed. I have seen many an epithelial carcinoma so located.

In the treatment of scirrhus of the tongue by amputation, several modes have been employed. One, that of the French school, is by means of an instrument known as the écraseur of Chassaignac. This is simply a delicate chain arranged from a handle, which little by little crushes off the part. Another mode, that of strangulation, consists in the introduction of circumscribing ligatures, which, being drawn tightly, cut off all circulation from the diseased part, thus compelling its separation. Still another is the use of caustic remedies; of these there is a great variety,—arsenic, however, forming the base of most of them. No remedies require to be used with more judgment and caution. If the practitioner desires to try a caustic, my own experience would suggest chloride of zinc:

℞.—Zinci chl.
Alum pulv. āā gr. v;
Acid. tannic. gr. ij;
Ferri persulph. gr. iij;
Glycerin q. s. for a paste. M.

To apply this paste, draw the tongue forward, hold it, and dry it carefully in a napkin. Lay some crystals of zinc on the part and cover over with the paste. This may be allowed to remain as long as the tongue can be kept dry. Finally, wash the débris away, and the application is completed.

It may happen, after such an application, that severe general glossitis will supervene; this will be unfortunate, and will imply that much more harm than good has been done. In making a caustic impression under such circumstances, the parts should be quickly killed, not excited and provoked.

The knife, the best instrument, removes, as is seen in the plate, all the parts supposed to be involved. Whether such knife be in the

form of the scalpel or scissors, it is, I think, the best instrument at our command, at least in the present state of our knowledge of such disease.

Injection of persulphate of iron is a means much employed and commended. My own experience with it, however, has not led me to look upon it as a specific.

The arrows of Maisonneuve, tipped with zinc, may be used by those who do not fear a resulting inflammation. Two, three, or more of such arrows may be made to circumscribe the tumor, precisely as practiced by this surgeon in his operations upon the mammary gland.

Benign Scirrhus.—Scirrhus of the tongue, purely fibrous or cartilaginous in character, is frequently met with. Such tumors appear in the form of lobules, or isolated masses. They are painless, with the exception of a soreness, the result of their interference with function; they do not tend to ulcerate, and when removed by the knife, do not return. Section of them by the knife, and examination under the microscope, show their relationship with normal tissues, and thus dissipate apprehension. These tumors, however, belonging to the sarcomatous class, may degenerate.

Encysted Tumors.—Cystic tumors of the tongue are not unfrequent. That known as meliceris is round, free from pain, and filled with a glutinous, honey-like substance. A peculiarity of this cyst is found in the fungiform character of its bottom, this portion looking pyogenic. A second order of cysts contains lymph, sometimes colloid in consistence and appearance, at others flaky, or, it may be, puriform.

Says Sir Benjamin Brodie, "There is a disease of the tongue which I have seen every now and then, and which I am sure is very often mistaken for cancer, though it is of a different nature. It is a curable disease, although it looks like a malignant one in many respects. The first thing of which the patient complains is enlargement of the tongue, with some pain. On examination, you find a tumor in one part of it, not very well defined, nor with any distinct margin. It is a softish tumor, and increases in size, and perhaps another tumor appears in a different part of the tongue, and that increases also. There may be three or four of these soft elastic tumors, with no very defined margins, in various parts of the tongue. This is the first stage of the disease.

"In the second stage there is a small formation of matter in one of these tumors,—a little abscess, which breaks externally, discharg-

ing two or three drops of pus. When the abscess has burst it does not heal, but another forms in one of the other tumors. These abscesses may assume the form of ulcers, and the ulcers have a particular appearance. In the first instance it is a very narrow streak of ulceration, but on introducing a probe you find that the ulcer is the external orifice to a sort of fissure in the tongue. The probe passes in obliquely; the tongue is, as it were, undermined by the ulcer, a flap of the substance of the tongue being over it.

"The disease now becomes more painful, and at last the ulcers may spread externally. In some instances they occupy a very considerable portion of the surface of the tongue, but generally they burrow internally, and do not spread much toward the surface. This is a very distressing state of things, and a man may remain in this state for a long time. The glands of the neck do not become affected, nor does the general health suffer, except from the difficulty of swallowing food. This is one inconvenience experienced by the patient; and he also labors under a difficulty of articulation. The tongue, from its enlarged state, may become stiff, not sufficiently pliable for the purposes of speech, and the patient either speaks thick or lisps.

"In some instances the disease may be relieved by a course of sarsaparilla, with small doses of bichloride of mercury. A strong decoction of sarsaparilla, with from a quarter to half a grain of bichloride of mercury, may be taken in the course of the day. Of course, if there be anything wrong in the general health, you should endeavor to get that corrected, and attend especially to the state of the bowels and the secretion of the liver. If the secretions of the digestive organs be unhealthy, a dose of senna and salts may be given every other morning, and blue pill every other night. When the patient is brought into this state, one remedy, as I have said, is sarsaparilla with bichloride of mercury; but, according to my experience, this is not the best remedy. The remedy best adapted for these cases is a solution of arsenic. Give the patient five minims three times daily, in a draught, gradually increasing the dose to ten minims. It should be taken in full doses, so that it may begin to produce some of its poisonous effects on the system. When it begins to act as a poison, it will show itself in various ways. Sometimes there is a sense of heat, a burning pain in the rectum; sometimes griping, purging, and sickness, and nervous tremblings. A patient who is taking arsenic, especially in pretty large doses, ought to be carefully watched. At first you may see him every two or

three days, and then every day; and as soon as the arsenic begins to operate as a poison, leave it off. When this effect is produced, the disease of the tongue generally gets well; but at any rate leave off the arsenic, and the poisoning will not go too far; it will do no harm. If, after a time, you find that the disease is relieved, but not entirely cured, you may try another course of arsenic. Perhaps it may take a considerable time to get the tongue quite well. Sarsaparilla, with the bichloride of mercury, may be given at one time; and at another, arsenic. You cannot give either of these remedies forever, and indeed the arsenic can only be given for a very limited period; but it is astonishing what bad tongues of this description I have seen get well under these modes of treatment, especially under the use of arsenic."

A form of cystic tumor, being a cystiform hypertrophy of a circumvallate papilla, is met with occasionally on the back part of the dorsum. These tumors have attained the size of a walnut. To the touch they are very solid, the walls being very much indurated. If convinced that there is no malignant association, the practitioner may puncture the sac and introduce a tent. Iodine may be used both externally and by injection.

Acute Glossitis.—Acute inflammation of the tongue, whether of idiopathic or of traumatic character, is always to be looked on with concern. The causes inducing this condition are various.

Viewed as a distinct condition, and this view, no matter what the cause, will always force itself on the attention of the practitioner when called to a case, the most urgent necessity will nearly always be felt for a treatment that shall abort or resolve the phenomena as quickly as possible. It is true that all glossal inflammations are not dangerous; but all inspire with a sense of danger.

Acute glossitis, idiopathic in form, commonly begins with a sense of enlargement and stiffness of some part of the organ, generally the anterior part; this soon becomes red, painful, and perceptibly swollen. At this stage the condition may rest, and after some little time commence to decline. On the other hand, a single hour may witness the extension of the inflammation to an extent which shall threaten or perhaps produce suffocation. In still other instances the advance is gradual; the circulation sympathizing, the pulse grows rapid and irritable, the skin becomes hot, only to decline to the cold sweating stage; and suppuration or perhaps gangrene terminates the action.

The dangerous character of glossitis demands the most energetic

treatment. Leeches direct to the organ or beneath the jaw, bleeding from the arm, catharsis, diaphoresis,—any or all of these means are successively to be brought into requisition. A plan of treatment, reliable as any in character, may thus be pursued: place on the back of the neck a cataplasm of mustard and red pepper; put the feet in water as hot as can be endured; give a full dose of sulphate of magnesia. If now the disease does not seem to be immediately held in check, put the patient in bed and administer spirits of Mindererus until full diaphoresis is secured. If even yet control is not secured, let fifty, seventy, or a hundred American leeches, or a third of the quantity of Swedish, be placed beneath the jaw. If the action is still unconquered, blood pro re nata is to be taken from the arm, and the tongue itself is to be freely incised. If yet the swelling goes on, and suffocation be threatened, laryngotomy or tracheotomy is made a necessity. (See these operations.)

A case presented before the North London Medical Society will be found interesting and suggestive in this connection:

"Mr. J. Z. Laurence exhibited the tongue of a woman who had died of acute inflammation of the organ. She had been under Mr. Laurence's care for acute rheumatism, when, on the evening of the 5th November, he was called to her, and found her sitting up in the bed, with a countenance expressive of the greatest anxiety, her face pale and bedewed with sweat; she breathed at long intervals, and laboriously; pulse 130. The cause of this was evident; she could not open her mouth to speak, for a swelling of the left half of the tongue, which was red, dry, and glassy. On the night of the 2d and 3d she had had severe rigors. Mr. Laurence at once made three free incisions into the tongue, and about half a pint of blood escaped. About two hours after the bleeding had ceased, the submaxillary region began to swell, twelve leeches were applied, and on the following morning the *right half* of the tongue began to swell, and by the afternoon it had attained full as great a size as the left. With this was a corresponding engorgement of the tissues about the jaw; the local depletion had had very little effect in reducing the swelling of the left side of the tongue; generally she was worse; rigors now came on, and the pulse intermitted three or four beats. Mr. Quain saw her, and proposed incising the right half of the tongue, but both patient and friends objected. Mr. Laurence saw her the last time alive the same night; her surface was deadly cold; pulse not perceptible at the wrist, yet, strangely enough, the respiration went on tranquilly, though feebly. Mr. Laurence at once perceived that

she was dying of slow asphyxia, and that her only chance was in tracheotomy; this was proposed with more impressive force than a surgeon almost dare do. She and her husband doggedly refused; next morning she was dead.

"*Autopsy.*—No organic disease was discoverable. The whole of the tongue was swollen, pale, and soft from maceration in a puro-serous fluid, which infiltrated the substance. The superior aperture of the larynx was greatly narrowed by serous effusion; the rima glottidis to a less extent; below this point, the whole of the trachea was perfectly unobstructed; the submaxillary region and anterior triangles of the neck were infiltrated with a serous fluid, which, among the suprahyoid muscles, had assumed a purulent aspect. The lungs were singularly healthy; the heart, kidneys, and bladder presented no signs of disease.

"From the above facts, it follows that tracheotomy would in all probability have saved the woman's life; and Mr. Laurence believes he proposed it at the proper time. It is true there was, throughout the case, not one fit of suffocation. On the contrary, she died choked in the most gradual conceivable manner; and were he to meet with another case, he would not defer the operation until the patient was in his last gasp, as was too commonly the case, but resort to it as soon as he saw the patient sinking, previous measures not having ameliorated his condition. A curious pathological fact, which Mr. Laurence noticed and pointed out to Mr. Phillips, who attended the case with him, was the successive and separate invasion of the two halves of the tongue by the inflammatory action, offering a remarkable instance of the dependence of pathological changes on the anatomical distribution of the blood-vessels."

Abscess.—In depraved and tainted conditions of the system, abscesses, of what might be called a cold character, occasionally form among the deeper muscles of the tongue; such abscesses are not necessarily associated with any marked inflammatory phenomena, but may have attention first directed toward them by the swelling which appears on the under surface.

The proper treatment in these cases will be found in voiding the matter through puncture as soon as fluctuation is perceived; otherwise it has happened that the pus has dissected its way down the neck, pointing in front of the hyoid bone, creating much derangement, and threatening even a fatal result. Treat these cases by local stimulating injections and the internal administration of tonic medicines.

The following suggestive case of abscess of the tongue, ending fatally from hemorrhage, is related by Mr. Ward, being presented before the London Medical Society:

"E. T——, aged seven, was born with a slight red enlargement in the center of the tongue. No inconvenience or difficulty in the ordinary motions of the tongue, or in swallowing, had ever been experienced; the general health had always been good. In the night of Sept. 27th, 1847, having been in her usual health at bedtime, she was attacked with pain and swelling under the chin and both sides of the lower jaw; slept very little, and the following morning had pain in the tongue, with great difficulty in speaking, or swallowing anything but liquids. She had an aperient powder at night, and the lower jaw was fomented frequently. In this state she continued for two or three days, and was visited by me on Oct. 1st, when the following appearances were noted:—Face flushed; eyes very bright; countenance anxious; great swelling, redness, and extreme tenderness of the parts under the lower jaw; very slight swelling of the tongue itself, which is covered with a thick, brown fur; is unable to open the mouth wide, or move the tongue beyond the teeth, or to speak, and has great pain in the mouth; pulse very quick and sharp; great heat of skin, and thirst urgent; bowels confined. Ordered eight leeches to be applied under the chin; to take, at bedtime, four grains of calomel; James's powder and sugar, of each three grains; a saline mixture, containing a scruple of nitrate of potash; one tablespoonful every three or four hours.

"Oct. 2d. Slept more last night than since first attacked; fever great; pain slightly relieved; swelling and redness less; mouth nearly closed; was able to swallow the powder in jelly, but refuses the mixture, of which very little has been taken; bowels freely relieved, evacuations dark and offensive; to take calomel and James's powder, of each three grains, and jalap, five grains, at bedtime; use a chloride-of-soda gargle, warm, to the mouth, by means of a syringe. Fluids taken in the mouth return by the nose.

"4th. Less fever; rests better at night; difficulty in swallowing or speaking the same; can open the mouth sufficiently to allow the tongue to be seen, which is nearly fixed, very little swollen, and still thickly coated; the breath extremely fetid; external redness and swelling still considerable; the tenderness great; pulse soft, quick, and weak; the bowels act freely; was able to pass my finger into the mouth; under each side of the tongue distinct fluctuation can be felt; while pressing on the left side the lining membrane gave way,

and was followed by a profuse discharge of fetid pus, mixed with blood; the point of the finger passed easily to the depth of the first joint, under the tongue, giving the sensation of a large pulp cavity; the tongue not very tender, can be moved from side to side by means of a small teaspoon, but not voluntarily. Apply strong poppy fomentation frequently, and linseed poultice; continue the chloride-of-soda gargle under the tongue, with the syringe, and take, of a mixture consisting of six grains of quinine, a teaspoonful every four hours; give a little port wine and water frequently, and milk or thin arrowroot for drink.

"6th. The pain less since the use of the poppy fomentation, generally sleeping for some hours after using it; the discharge of pus and saliva very copious and offensive; lies with the head on the left side to allow the free exit of the discharge, otherwise the mouth is constantly filled; fever less, as also the swelling and tenderness; redness gone; great debility and considerable wasting of the body already; can swallow fluid, and is eager for the wine; very little quinine has been taken; bowels act twice a day; can open the mouth wider, but is still unable to protrude the tongue, which is cleaner and moister; on slightly raising it by the handle of a spoon, a large jagged opening may be seen on the left under side of the lower jaw, from which, by gentle pressure under the chin, a profuse discharge of thick pus wells up, of which I pressed out at least two ounces; pulse soft and weak. Continue the external applications; apply the chloride-of-soda gargle frequently to the mouth and under the tongue, with the syringe; take a mixture consisting of two ounces and a half of decoction of bark, syrup of orange-peel, and tincture of bark, of each two drachms, a fourth part three times a day; continue the wine, and give strong beef-tea and arrowroot frequently.

"9th. Altogether improved; discharge less, but still fetid; takes fluid nourishment frequently, and the wine; the general swelling and the tenderness reduced; more on the left side under the jaw than the right, and is unable to protrude the tongue further. Continue all the applications and the mixture.

"11th. Has not rested so well the last two nights, and has had more pain, particularly on the right side, which is more swollen and very tender, the left side being almost in its natural state; the discharge has been profuse, but thinner; the tongue is moist and clean; not very tender, but less movable; the opening under the left side of the tongue smaller; fever returned; has constant hacking cough; not able to swallow so well, or to speak so as to be

understood. Apply six leeches under right side of lower jaw; continue the fomentations and poultices; also, bark mixture and port wine.

"12th. Has slept very little from the frequent coughing, which tires her very much; discharge from the mouth less and thinner, but still fetid; emaciation extreme; has changed the position of lying to the right side; left angle of the mouth drawn down; the swelling and tenderness on the right side very much increased since yesterday; feels soft; is more prominent in the center, and appears pointing here; the finger in the mouth can detect very distinct fluctuation under the tongue, which is thickly coated and very tender; takes very little nourishment, only a teaspoonful at a time: prefers wine to other things. Continue the fomentations and poultices.

"13th. Has had a bad night; is very irritable and feverish; mouth nearly closed; unable to examine the tongue; the swelling about the same; the right cheek and under side of the jaw of a dusky red color, and very shining; so tender that she has again changed the position; lying on the left side; cough less, pulse very small and weak; takes scarcely anything; discharge more copious, thicker, and slightly tinged with blood; it now appears to come from the right side. In the evening, while coughing, a large gush of blood took place from the mouth, mixed with pus, and flowed freely for more than ten minutes. By applying ice internally and externally (which I had directed to be in readiness), the hemorrhage was arrested. A cold lotion was applied externally, and an alum gargle frequently to the mouth.

"14th. Has slept very little; unable to lie down, from the constant discharge of fetid pus and saliva from the mouth; the swelling of the right cheek and side of the jaw less; very tender, of a dull, yellowish color; able to open the mouth so as to examine the tongue, which does not appear enlarged; no power of moving it herself; is thickly coated with a dark fur, and when pressed upon, a profuse discharge of thick pus fills the mouth immediately; no return of the hemorrhage; is very pale and faint; pulse very small and weak; has taken more nourishment since last night than for some days before, such as port wine, isinglass in milk, beef-tea, jelly, etc. Continue the lotion and alum-gargle to the mouth with a syringe. At half-past seven P.M., in the act of swallowing a small piece of bread and butter, profuse hemorrhage occurred from the mouth, and more than a pint of blood was lost before it was again

arrested by the free application of ice; it was of a bright arterial color. She became faint, and expired at nine P.M.

"On the day following I made a post-mortem examination of the parts affected. The parotid, submaxillary glands, and other parts, having been brought into view, were found (on the right side) so much softened, decomposed, and mixed with coagulated blood and pus, as to be recognized with difficulty, and it was impossible to trace from what vessel the hemorrhage proceeded, such was the destruction of the parts. On the left side, the glands were of a greenish color, very much softened, and bathed in pus. A probe passed readily by the side of the jaw into the mouth. I divided the trachea just above the sternum, and dissected the larynx and tongue carefully out. The morbid state of the tongue is shown in the preparation before the society."

In the discussion which ensued, the case was considered a very remarkable one. The remarks chiefly had reference to the cause of the disease, respecting which various opinions were expressed.

Effusions.—The tongue is occasionally the seat of most formidable congestions or effusions. In the space of a single hour I have known an inflamed tongue so swell as almost to prevent respiration. The organ, in these cases, looks so vascular that one hesitates to use the knife, when enlargement arrives to an extent which threatens suffocation. I am sure I suggest the very best practice when I say incise freely—cut deeply from behind forward, either side of the median line, avoiding, however, in the depth of the cut, the ranine arteries. The wounds thus made will bleed for a time freely, indeed, alarmingly; but the common experience is that they soon close, and need give little or no anxiety. Velpeau has recommended the opening of the ranine veins in congestion. Leeches are also applied direct to the tongue.

Erysipelas.—A formidable danger in the tongue is the presence of erysipelas: this may be idiopathic, but is most frequently traumatic, operations about the jaws being, unfortunately, liable to provoke this condition. The treatment of erysipelas in the tongue is the history of its treatment elsewhere. Iron and quinia, internally and locally, should be freely employed. If this should not be found effective, then make incisions. The practitioner is never to forget to extend his observations over functional disturbances which may exist.

Bites of Insects.—The most severe and threatening glossitis I

ever met with was the result of a sting of a wasp taken into the mouth while eating blackberries. The tongue in these accidents swells enormously, yet, happily, tends to a rapid self-cure. If seen immediately, the very best application is dilute ammonia; later, we can only treat such an inflammation like any other of the sthenic type. It is well, however, to remember that the swelling is from effusion rather than a congestion; incisions, if necessary, may always be freely made. Iodine, in these instances, acts sometimes very happily; paint the tongue thoroughly, and hold cold water in the mouth. If, unfortunately, erysipelas should supervene, the iron and quinia combination is at once to be resorted to. In these cases the pain becomes excessive, the parts may change to a livid hue, and there seems to be a decided tendency to gangrene; particularly is this the case in depraved and broken-down persons. Free incisions are never to be neglected: the erysipelas in these cases depends upon the separation of the molecules—if the expression may be used—from their base of supply; the incisions, draining the organ, allow contraction of the parts, and thus restore the circulatory relationship.

In ulcers, or in tumefactions of the tongue, provoked by irritating teeth, it is seldom necessary to do more than remove the source of offense. Cases occur, however, where some after-treatment is demanded, the provoked ulcer being indolent, or, in some instances, even semi-gangrenous. For all such ulcers, the best wash that I have ever used is water, changed in color to a milky blue by the addition of the compound tincture of capsicum. Where a part is simply indurated and not ulcerated, it is better, for a time at least, to leave the case to nature. My own rule is, never to meddle with an induration but from necessity. In all these cases injudicious meddling will be found very bad practice. I recall an instance coming under my observation a short time since, in which, while in the act of filling a tooth, a practitioner had thrust an instrument quite deeply into the tongue; severe inflammation was the result, the effect, I imagine, of uncleanly rust or blood-stain. On the subsidence of the swelling, the wound, being found to discharge, was injected with strong solutions of nitrate of silver. A week of this treatment resulted in the formation of a tubercle as large as a hazel-nut; the injection was now ordered to be discontinued, and in two weeks the tubercle had disappeared.

Erectile Tumors.—Of the erectile growths I have never personally met with a case situated upon the tongue; instances, however, are

reported. The history and treatment of such tumors would be precisely that of other nævi.

Fatty Tumors.—These, like the erectile, are uncommon. A case which I once saw exhibited the tumor looking like a mass of very smooth fat, encysted by the mucous membrane: the situation was the inferior left surface of the organ. As the man spoke, the tumor would bulge out over his lower teeth, presenting a most unsightly appearance. The patient would not submit to an operation, and it was with a feeling of disappointment that I afterward found myself unable to follow the history of the case.

Metastatic Disease.—The example herewith given explains, without other remarks, a character of trouble rare, yet sometimes met with, upon the tongue. We may recognize in the disappearance and reappearance of the various exanthems an explanation of the condition. "I have been consulted," says Mr. Wm. McClure, in a paper read before the Harveian Society, "by a young married lady, for rather a curious affection. She informs me that her tongue becomes occasionally bestudded with small ulcerations, and afterward, when these get well, the palm of her left hand becomes affected with a sort of psoriasis palmaris. The tongue is at present quite well, but the palm of her hand is covered with the eruption. When this gets better, however, she expects her tongue to become again the seat of disease, for thus they have alternated for a considerable time past—she says about two years. The chief reason for which she consults me at present, however, is that she has gout in one of her feet. I believe that the whole series of her complaints depends on some derangement of the digestive organs, though that is not made very apparent by external symptoms. I gave her an alterative pill, and a tonic mixture, combined with colchicum and an alkali. The gout has already disappeared, and even the hand is much improved. As soon as the gout was got rid of I substituted for the tonic mixture—in which, as I have just said, were wine of colchicum and carbonate of soda—a mixture composed of the extract of sarsaparilla combined with the iodide of potassium. As a local application to her hand I prescribed an ointment composed of pure iodine, iodide of potassium, and hog's lard; but this was found, upon trial, to give her so much pain, and produced so much irritation, that I was forced to abandon its use after a few days' trial. For it I substituted the following ointment, viz.: white oxide of mercury four grains, and extract of conium a drachm, rubbed up with seven drachms of prepared hog's lard. This ointment was ordered to be rubbed into the palm of her

hand every day, both morning and evening. Besides these remedies, local and general, she took occasionally an alterative and aperient pill, made up of blue pill and the compound extract of colocynth. The consequence has been, after a month's steady use of the remedies, that the hand has become quite well, the skin being now, for the first time these two years, soft, white, flexible, smooth, and completely free from itching, heat, and every unpleasant appearance and feeling. Nor has the tongue as yet shown any tendency to alternate disease, as before; so that we have reason to hope—the constitution having been set to rights by the means employed—the former chain of morbid sympathy between the distant organs of which we have been speaking, and by which a metastasis of the psoriasis, from the one to the other alternately, took place so often, for so long a time, has been at last broken and destroyed, permitting both to remain in their healthy condition."

Urticaria, a very common skin trouble, I have myself met with as having a similar metastatic relation. In this case a wheal would appear either upon the cheek or the tongue whenever ice-cream was eaten.

Hypertrophy.—This condition has been met with and described by various writers. Hypertrophy may be complete, involving the whole organ, or the enlargement may pertain to particular tissues alone. A case is described by Mr. Paget, involving the muscular substances exclusively, the primitive fasciculi being found to divide in a dichotomous manner. The epithelium is another of the tissues most frequently found affected, instances being on record where this structure has thickened so as to resemble a coat of mail. Granular hypertrophy, a condition of enlargement of the papillary structure, is sometimes seen in the form of a mass of warty excrescences covering the whole body of the tongue; at other times it is confined to some portions, more or less limited in extent.

The treatment of a hypertrophied tongue must be governed by the circumstances and character of each particular case. In epithelial hypertrophy the best results seem to have been secured through the use of arsenic,—from the thirtieth to the twentieth of a grain being administered three times a day, its effect being carefully noted. Donovan's solution, the liq. hydrarg. arsen. et iod., given in five-drop doses, has been highly commended.

In granular or papillary hypertrophy, the use of chromic acid will be found desirable, touching the various excrescences daily with the crystals. Another excellent application is the solution of the per-

chloride of iron. Cutting the warts away in mass, by the use of a pair of scissors, may be practiced where the parts are not too vascular. Pyroligneous acid is another favorite means of cure.

In a true hypertrophy of the organ—that is, where the body has enlarged, as a result of congenital impressions—medicinal appliances are of little service. This disease is markedly one of young life, commencing generally very soon after birth, and progressing tardily but surely until death or an operation gives relief. Unaccountable though it may seem, hypertrophy is confined almost exclusively to female children,—this sex being affected in the proportion of five to one.

As may be inferred, hypertrophy of the tongue presents various degrees of enlargement,—cases being on record where the organ has hung from the mouth, resting upon the breast. In the cases of elephantiasis, the mucous membrane looks more like the bark of a tree than anything else, being rough, dry, and crusted.

In the treatment of hypertrophy, we consider the character of the trouble from the twofold aspect of activity and chronicity. Where the first of these characters exists, much may be hoped for from medication; where the latter obtains, little may be expected except from operation.

Compression, as recommended by Lasser and indorsed by Prof. Syme, it may not be amiss to try before proceeding to excision; but the treatment will certainly be found to have much more of failure than of success in it.

Excision of the Tongue.—From surgical necessity, or from accident, it sometimes becomes necessary to amputate a part or even the whole of the tongue. Surprising as it may seem, such amputations, even when of the complete organ, interfere very little with the speech, and do not entirely obliterate the sense of taste. Mr. Nunnely, an English surgeon, lately exhibited to the Pathological Society of London a patient from whom he had removed the whole of the organ; this being effected by a submental opening; the patient, a man aged thirty-five, never having a bad symptom. The disease, which had existed sixteen or eighteen months, became worse two months before the operation, and from the pain and difficulty of speaking, the impossibility of mastication, and difficulty of deglutition, was fast wearing the patient out. When shown to the society, the patient had recovered strength and flesh; indeed, said that he felt as well as ever; he talked with great distinctness, and swallowed with facility.

A second interesting case is reported by James Syme, F.R.S.E., Surgeon-in-Ordinary to the Queen in Scotland, and Professor of Clinical Surgery in the University of Edinburgh:

"About twelve months ago," says Mr. Syme, "I communicated a case in which the tongue had been completely removed by excision, on account of extensive disease that threatened to prove fatal by preventing the admission of nourishment. This account was necessarily limited to the operation and its immediate effects, as sufficient time had not elapsed for determining whether or not the relief afforded would prove permanent, or how far the powers of deglutition, articulation, and taste would be restored. After his return home to Manchester, the patient sent me favorable reports of his progress, but certainly not such as to convey any adequate idea of the improvement that had taken place since he came under my care. He was then emaciated and bent down by long-continued suffering, unable to articulate, so as to require a slate and pencil for expressing his wishes, and swallowing even fluids with such extreme difficulty as to feel on the point of starvation. My surprise may, therefore, be imagined when, on the 10th of September last, he unexpectedly made his appearance, erect and vigorous, and, seeing that I did not recognize him, announcing his name in a loud, clear voice. The feeling thus excited was not lessened by learning that, while traveling in the Highlands, he had dined at table-d'hôtes, and entered into conversation without betraying the deficiency under which he labored. Very much astonished by a result so much better than could have been anticipated, I requested a number of my medical friends to join me in examining the state of matters. Professor Goodsir and Mr. Nasmyth having satisfied themselves that no vestige of the tongue remained, various observations were made with regard to articulation and other functions of the absent organ; and Mr. Annandale afterward instituted a more particular inquiry, of which he has given me the following report:

"'The lips and jaw-bone, where divided, were soundly united without any deformity. The opening between the mouth and pharynx was much diminished in size and irregular in shape from contraction of the fauces and soft palate, which were drawn downward and forward more to the right than the left side, from the mucous membrane at that part having participated in the disease and been removed along with the tongue. Mr. W—— says that he can swallow as well as ever, provided that the food is either finely divided or fluid. He is also able to masticate solid substances,

although difficulty is sometimes experienced from their getting into awkward parts of the mouth. In ordinary speech his words are wonderfully clear and distinct, and he can sing without any difficulty. All the vowels and words composed of them are articulated perfectly, and also the following consonants: B, C, F, H, K, L, M, N, P, Q, R, V, W. D is pronounced "dthe," J "the," G like "sjee," "S" is a lisp. His taste is impaired, but still enables him to distinguish different articles and their respective qualities, as grouse from partridge, bitters from sweets, good beer from bad beer, etc. He has remarked that the seat of sensation lies somewhere in the throat, since there is no recognition of taste previous to the act of swallowing; and, in order to ascertain the truth on this point more precisely, the following experiments were made:

"'1. A strong solution of salt was applied by means of a camel's-hair brush to the fauces, palate, floor of the mouth, lips, and inner surface of the cheek, with the result of something being felt in the mouth; but no idea formed as to its nature.

"'2. About a quarter of a teaspoonful of finely-powdered sugar was placed on the floor of the mouth, and, having been allowed to remain there a few seconds, was then brought thoroughly into contact with every part of the cavity without any recognition of its nature; but when a little water was added and swallowed, the taste was immediately perceived.

"'3. The same experiment was repeated with another substance (salt), and with the same result.'

"It has long been known that large portions of the tongue may be removed without destroying or materially impairing the power of articulation; but I am not aware of any case on record in which it has remained so perfect after complete removal of the organ. Of the facts above mentioned, the one that seems most curious is the connection between taste and deglutition; from which it appears that the latter is essential for the full perception of the former. If the pleasure of taste could be perfectly gratified by mastication without deglutition, there would be no limit to the consumption of food; but the instinctive desire to swallow an agreeable morsel affords a check to any such abuse."

Mr. Paget reports the following case:

"On the 20th of February a little girl, about three years of age, was brought into the operating theater of St. Bartholomew's Hospital with hypertrophy and prolapsus of the tongue, which commenced when she was some six months old. It now protruded

nearly two inches, and hung downward, completely filling the circle of the lips; its end was dry, and excoriated with hardened epithelium, a sort of crust having formed of the size of a shilling; several of the papillæ also were enlarged, and in places gave to the tongue a warty or granular appearance. The lower jaw had already begun to be deformed, and expanded downward and outward; the teeth were gradually separating from one another in the mental portion of the jaw; and there was dripping of saliva. An examination of the tongue by Mr. Paget showed that the organ was truly hypertrophied, and the part not prolapsed completely filled the cavity of the mouth.

"Chloroform was carefully given to the child, and the chain of an écraseur was passed around the tongue within the mouth, the jaws being kept open by a metal gag. The chain was slowly drawn home, and the prolapsed and hypertrophied portion was detached with little or no bleeding.

"On examination of the piece removed, its structure was found to be similar to that of the natural organ, both in texture and color; it was simply a redundancy of growth, from hypertrophy.

"The subsequent progress of the case was reported as most satisfactory, a good recovery being recorded."

Partial amputations of the tongue have been very frequent. Union, in many of the cases, is very rapid and perfect. In one case, that of a child, where a kind of a flap operation was made, I got reliable union in a single day, and never had trouble with it afterward.

Subfig. 1, in plate, is a front view of the anatomical relations of the parts about the fauces as shown with the mouth widely open. 1, the dorsum of the tongue; 2, 3, the tonsils; 4, the uvula; 5, the anterior half arch; 6, the posterior half arch, with the tonsil between it and 5; 7, the soft palate.

Subfig. 2 represents a side view of a vertical section of the mouth and tongue, showing the relations of the vessels and nerves of the tongue. 1, the lingual artery; 2, its sublingual branch,—the veins accompanying the arteries; 3, the hypoglossal nerve; 4, the ranine terminations of the lingual vessels.

Subfig. 3 represents the situation and associations of a disease compelling amputation of a section of the tongue. The lines, 1, 2, 3, form a V, which is to circumscribe the growth; it should, however, have been placed much farther back.

Subfig. 4 exhibits the operation of excising the tongue, as practiced with scissors. When the knife is used, the sections are similarly

made. If, in such an operation, the hemorrhage is threatening, it is better to quickly ligate the vessels of one side before making the section of the other; this suggestion, however, only holds good when the bleeding orifices are freely exposed, and can be reached without effort or difficulty.

Subfig. 5 shows the preceding operation completed, and the flaps united by ligatures. 1, 2, represents the sutures,—wire pins or waxed silk may be used. Let them be left in only long enough to secure the union; this, if no undue inflammation supervenes, will be accomplished in from twenty-four to forty-eight hours.

Subfig. 6 is the lingua vitula, or lingual hypertrophy. The particular case here represented was a patient of Dr. Harris, of Philadelphia, and was the first operation performed in the United States. The case is thus described by Prof. Smith in his System of Surgery.

"The patient, aged nineteen, had the tongue enlarged at birth. A short time previous to the operation it projected beyond the upper incisors at least three inches. Its circumference was six inches, and its vertical thickness one inch and a half; it filled up the jaws so completely that it was necessary to have his food cut into small pieces and introduced at the side of the tongue."

The operation practiced by Dr. Harris was accomplished as follows: "The tongue being elevated, a strong ligature was passed through its top so as to control its movements. The under surface was then dissected from the floor of the mouth about three-fourths of an inch behind the anterior part of the jaw, and a strong, straight bistoury introduced into the organ at a point where the dissection terminated, whence it was pushed through between the median line and the left ranine artery, and, being drawn laterally and forward, was made to cut a flap, which terminated near the first bicuspid tooth. The left ranine artery being then secured with a ligature, the bistoury was again introduced in a corresponding position on the right side, and the opposite, or right flap, made in a similar manner. The artery of this side being now secured, and the space intervening, or central portion, divided by strong scissors, the incisions or flaps resembled the letter V, and, being approximated by these interrupted sutures, made a pointed, well-formed tongue of the ordinary length. A year subsequently, the patient articulated distinctly, and was relieved of all deformity."

In another case, somewhat similar to this, under the care of the same surgeon, a ligature was applied to the enlarged portion, in order to cause it to slough off; but the irritation, Professor Smith in-

forms us, was so great that Dr. Harris found himself subsequently compelled to amputate the end of the tongue with a catlin. In this patient the organ protruded four inches; its circumference was over six inches, and its vertical thickness nearly two inches.

The subfigures 7 and 8 represent the amputation of the tonsil gland with the knife, and with the tonsillotome. (See Tonsil Glands.)

Tongue-Tie.—The condition denominated tongue-tie is frequently met with in young children, and, indeed, occasionally in the adult. Tongue-tie is simply a shortening or curtailment of the anterior mucous frænum. A tongue that cannot be projected beyond the teeth is tied, and a tongue so tied cannot perform its various offices comfortably and naturally. In examining the mouth of a child thus afflicted, the tip of the tongue will not unfrequently be found drawn down and fixed to the floor of the mouth, incapable, indeed, of any movement. These, however, are extreme cases, the usual condition being simply curtailment of natural motion.

Tongue-tie is of two kinds, adventitious and congenital. Of the first, that arising from ulceration is the most common. A person having a bad ulcer under the tongue, particularly if on the side of the frænum, is almost sure to have this fold shortened as the result of cicatrization.

A second form is one described by Professor Dewees, exceedingly rare, I imagine, but worthy of note.

"Very frequently," says Professor Dewees, "there is attached to the frænum of the tongues of new-born children a nearly transparent, whitish membrane, which pursues the natural frænum through its whole course, continues beyond the point where the frænum stops, and terminates near the extremity of the tongue itself; so that the tongue is tied down, as it were, to its proper bed.

"In consequence of this disposition of the frænum, the child cannot elevate the tongue or protrude it beyond the lips; and in its attempts to suck, it cannot apply it with sufficient force or certainty to the nipple to make a complete exhaustion; therefore it can suck but imperfectly; and this is accompanied by a clucking kind of noise. Whenever this is observed, the mouth should be examined, and it will almost always be found in the situation just described; but not necessarily, as there may be clucking without this membrane; but this membrane, we believe, is never without the clucking.

"This membrane is easily discovered by provoking the child to cry, or by elevating the point of the tongue by the extremity of the

little finger. In making the attempt to raise the tongue, the child is almost sure to cry; and then this membrane is readily discovered, as it is now fully upon the stretch.

"This defect is easily remedied. It should be done in the following manner: let the child be laid across the lap of the nurse, with its face toward a proper light, and the operator stand behind the head, so that he does not intercept the light. The chin of the child must be gently depressed by the forefinger of the nurse. When the chin is thus depressed, the little finger of the left hand of the operator must be insinuated between the side of the tongue, near its tip, and the inner corresponding portion of the jaw, until it can lift up the point of the tongue; which being done, the membrane is immediately brought into view, and upon the stretch; or, should the child now begin to cry, as it almost always does, the operator can easily place his finger under the tongue, and keep this false frænum tense, while, by a single stroke directly across it by a sharp gum lancet, he divides it to the true frænum: the operation is then finished. We have never known it necessary to repeat this operation. The incision through the membrane never yields more than a small drop of blood; no hemorrhage can ensue, as this tissue is but very slightly vascular."

A third of the adventitious forms is the result of the induration of the frænum. This is occasionally venereal in character, but more frequently carcinomatous. In these cases the band gradually thickens until the motion of the tongue is markedly impaired. The cancerous is distinguished in its incipiency from the venereal disease by the greater pain associated with the movements of the parts: in the first, the pain is acute and sharp; in the second, it is soreness rather than pain. If the induration is malignant, the parts may be excised, but a hope of cure is very slight; if venereal, we pursue the specific treatment conjoined with such general and local combinations as may seem demanded by the particular case. Donovan's solution, given in five-drop doses, is quite reliable; the practitioner is to avoid overirritation to the frænum.

Congenital tongue-tie is quickly appreciated by lifting the tip of the organ. These cases differ very much, the frænum, at times, being observed to run as in the normal course, except that it is much shortened. In other instances the fold passes forward almost to the apex. This fold may be free or tight. If the former, it forms a septum between the lateral aspects of the floor of the mouth, but is

not otherwise inconvenient; if the latter, it ties the tongue more or less closely.

The relief of a congenital tie consists in nicking or cutting the contracted frænum. This operation, although of the simplest nature, requires to be performed with some care. A frænum too freely cut will permit of the tongue being pulled quite far back into the fauces; cases being on record where suffocation has nearly resulted from such accidents. Again, it is not to be forgotten that the ranine vessels inosculate just in front of the frænum on the under surface of the tongue, and might very easily be divided in an operation, many children having lost their lives from such an accident.

A proper operation consists in making a simple nick midway between the tongue and the floor of the mouth: a rupture of the part thus secured, the motions of the tongue will quickly secure all the latitude required. Should an operation, unfortunately, open a vessel, the best practice would be to secure it with a ligature: this, unfortunately, is not always easy to be accomplished, the artery retracting within its loose sheath. A mode devised by M. Petit to control such a hemorrhage consists in taking a piece of ivory, cut fork-shape—the prongs, of which there are two, passing on either side of the frænum, the short handle resting against the inside of the jaw. To apply this instrument, introduce against the bleeding vessel a tuft of lint saturated with alum-water, or other astringent; place now the fork about it, and secure it in place by pressing it down with the tongue, over and around which, and the jaw, a roller is to be thrown.

Swallowing the tongue, as it is called, is a disagreeable accident, and may occur without section of the frænum. Dr. Dewees mentions one case in which a child became choked several times a day from such a recession. It was always, however, relieved by the nurse, who would press the organ down with the handle of a spoon and then draw it forward. A second case, reported by Professor Gross, resulted in the death of the child at eighteen months.

To operate for tongue-tie, it is best to place the body of an infant upon the lap of the nurse, the head being received upon or between the knees of the surgeon; the tip of the tongue is now raised, and the cut, or nick, made with a pair of curved scissors.

CHAPTER XXXVIII.

THE APHTHÆ.

Aphthæ is a term which every reader must have remarked to be associated (like the word *epulis*) with some degree of confusion.

In the Greek, from which the term is derived, there are two verbs with the same spelling—ἅπτω. The meaning of the one is "to set on fire;" that of the other, "to bind to" or "to fasten upon."

The mouth presents ulcers or sores of various signification,—some which are characterized by pain of a burning, inflammatory character; others, chronic, or cold in nature, furnish an inviting soil to a very persistent and almost omnipresent parasite—the oidium,—this fungus fastening upon and binding such sores in its necklace-like embrace. It has thus very naturally occurred that pathologists, seeking an expressive term by which to designate these varying conditions, differently employed the common name as it happened to them to observe or adopt the one or the other of the roots from which the expressions were derived. That such uses of the dissimilar verbs on the part of various authors must have been made, is necessary to be inferred to explain the differences which characterize their descriptions.

With such examples of liberty, intentional or unintentional, I may be excused in presenting to my readers the subject after my own manner and views

For the reasons of the double derivation, and for others which I shall proceed to present, the term aphthæ cannot, in justice and pathological signification, be applied to a particular species of sore, but must, as a noun of multitude, apply to a class—which class has many species. Thus we may accept as explained and dismissed the various questions of ulceration and non-ulceration, exudation or non-exudation, the oidium or no fungi.

The type of aphthæ is as follows: An aphtha or aphthous patch is a degenerate sore, to be seen, under varying circumstances, upon the mucous surface of the mouth, the fauces, the œsophagus, and,

quite likely, upon any part of the alimentary canal, and perhaps as well the respiratory tract. The most common seat of this patch is the uvula; next to this the lower lip; next the tongue. The sore varies in size, from the smallest point to a confluent mass which may cover a large surface; looks pasty or exudative, is generally oblong in shape, and varies in color from the misty white of hoar-frost to the dirty-yellow of scrofulous pus. As most frequently seen, such a patch is one of perhaps several similar sores.

This, as described, is the type case. From it we are prepared to pass to the general view of the subject.

An aphtha is a canker; nothing more, nothing less. Thrush, follicular inflammation, cancrum oris, gangræna oris, are all species of a cancroid class, of the class aphthæ.

What, then, is aphthæ?

The modern microscopist exhibits and describes aphthæ as patches of a fungoid excrescence—the oidium albicans. A pot of paste, a papered wall, a section of apple or other fruit, the leather back of a book or chair, exposed to a confined atmosphere, hot and moist, quickly enough produces, or rather gives attachment to, the oidium.

Oidium albicans is not a disease, is not aphthæ; neither is it the expression of disease. It is merely a fungous growth, accidentally associated with a soil and circumstances favorable to it as a habitat.*

Aphthæ is, without doubt, the expression of a cachexia, and is

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* Parasitic fungi (Hogg on the Microscope), vegetable blights as they are commonly called, have of late years become objects of earnest attention, on account of the enormous damage done to our growing crops, and also of the many curious facts in their history which have been brought to light. Oidium is a common mildew.

It appears that at particular periods of the year the atmosphere is, so to speak, more fully charged with the various spores of fungi than it is at others. In 1854, the Rev. Lord Godolphin Osborne, during the cholera visitation, exposed prepared slips of glass over cesspools, gully-holes, etc. near the dwellings of those where the disease appeared, and caught what he termed aërozoa,—chiefly minute spores and germs of fungi.

From this same year (1854) to the present time, we have amused ourselves by catching these floating atoms, and, so far as we can judge, they are found everywhere, and in and on every conceivable thing, if we only look closely enough for them. Even the open mouth is an excellent trap. Of this there is ample evidence, since we find on the delicate membrane lining the mouth of the sucking, crying infant, and on the diphtheritic sore-throat of the adult, the destructive plant oidium albicans.

not likely to be a merely local disease. Neither, I conceive, is it possible for the fungus to be peculiar to a sore, as a something specific, any more than it is peculiar to the paste, the fruit, or the book. It depends in the one instance, as in the other, upon an accidental association. This accident, in the case of the sore, is the absence of a sufficient vitality to enable a part to resist the "fastening upon itself" of ever-present parasites. The microscopist, if I may be allowed to suggest it, has, in his examinations and conclusions, accepted the accident and overlooked the true disease.

Thrush or muguet, one of the species, is an erythematic inflammation, degenerating after a few days into a condition of curdy exudation. The inflamed surface, after a longer or shorter time, presents small whitish points; these coalesce, forming the exudate patches. These patches vary in color; as they remain moist and clear, they are considered with least apprehension; as they grow dry and brown, they are esteemed possessed of dangerous import.

Dissections of the cadaver have exhibited aphthæ not only upon the œsophageal mucous membrane, but also on other parts of the alimentary canal. They have not as yet, so far as I am aware, been met with upon the respiratory tract; but there is no good reason why they should not have here a like existence.

In an acute attack of thrush the mouth is hot and the general condition feverish. Milder cases, or those of easy progress, seem—so far as any observable constitutional sympathy is concerned—to have alone a local signification.

But, if thrush is a distinct disease, could it be possessed of a double signification? Could it at one time be strictly local, at another systemic? Thrush is common to children prematurely born or nursed by unhealthy women. It belongs to hot, moist climates, to the situations of uncleanly hospitals; in fact, to any and every condition deemed to be depressive of the life-force; it is, in short, a systemic adynamic expression, seated on a mucous surface. That it differs from carbuncle or cancrum oris is not the case in fact, but only in degree; it is, in other words, one expression of a common condition,—a species, and not a class.

Follicular inflammation—another form of stomatitis very likely to be asthenic—is a term used to signify that the abnormal vascular change is seated in the mucous crypts or follicles. In passing the finger over a surface so inflamed, the studded irregularity produced by the engorgement of the glands is plainly evident. As such inflammation progresses, the bodies become recognized by the

eye as papular eminences standing out from a common erythematic surface. In color they are of a varying red, such variations in shade expressing the constitutional conditions.

Follicular inflammation terminates either by resolution or ulceration; when in the latter way, the follicles soften in the center, suppurate, and have the bottom filled with a whitish, pasty mass; when in this condition, they are the aphthæ of M. Billard.

Follicular inflammation appears most frequently in the infant during the dentitional period,—an explanation existing in a quickly and easily recognized combination of a predisposition and an excitant. In its most simple form,—that is, where there is no marked dyscrasis, or where the excitant is not of sufficient intensity to irritate to any extent,—the lancing of the gums, or the application of cooling local remedies, may be sufficient to combat or control the manifestations. Where, on the other hand, the conditions predisposing to the disease exist in a state of balance, as it were, with the natural resistive forces, the addition of a second depressant influence, as that resulting from the irritation of dental development, may very well be understood as giving the mastery to an agent or condition otherwise controlled or held fully in check. Thus we explain to ourselves the real and apparent connection of dental irritation with the aphthæ.

From a simple form, or the inflammation of isolated follicles, the condition, in some ill states of the general system, becomes confluent, such extreme form being most frequently noticed in the typhoid exanthems, or in destructive organic diseases. In confluent follicular inflammation, a prognosis can only be justly made when every associate and collateral influence has been appreciated. The condition will nearly always be found an occasion for anxiety.

Cancrum oris, a species of stomatitis, generally accorded a special classification, differs in no wise from that just considered, except in being more localized, as if the force of the influence had concentrated rather than diffused itself.

The complaint known as cancrum oris is an asthenic, spreading ulcer. In appearance this ulcer differs from what has been given the special definition of aphthæ by most writers, only in being more depraved and threatening. It has the same pasty bottom of varying shades of white, the same association of pain, the same variation in persistence. Like other aphthæ, cancrum oris seems to be, and is, associated with dyscrasis, appearing most commonly in the infants of ill-conditioned charities, in the ill housed and poorly fed,—having,

in all systemic associations, the precise history of the species alluded to as thrush and glandular inflammation.

This form of stomatitis, although confined to no exact locality, is yet most commonly met with on the cheeks or gums. It may commence with a phagedenic impression, and very quickly destroy the patient; or a slight vesicle or pustule may first appear, to be followed by varying inflammatory associations, precisely as if some local poison was the source of the trouble.

The history of cancrum oris differs from that of other cancroid affections alone in degree. This is fully proven in the facts that it is associated with the same causes; that any ordinary canker sore is capable of taking on an ulcerative action; that the fungus oidium is quite as common to the seat of this as the other affections. In fact, every analogy will demonstrate that the relation is like that which associates the phagedenic with the simple venereal sore, being the difference of degree and not cause or character.

Gangræna oris, sloughing phagedæna, is another degree or species of the common class. It may commence as an acute inflammation, quickly deteriorating, as a species of fatty degeneration of the epithelial tissue, as a submucous effusion, or as an eschar which falls from its relations with a rapidity which leaves us at a loss for an explanation, except on the inference that the materies morbi have had the most special concentration. The eschar, formed sooner or later, is ashy in color, or a deadish brown, while the still living parts, particularly the external cheek, if this part should be the seat of the ulcer, has an erysipelatous blush,—white, semi-livid, and threatening in appearance.

Gangræna oris is markedly a disease of the dentitional period, occurring in ill-fed, ill-clothed, or ill-housed children, between the first and second dentitions. Most conspicuous is the constitutional nature of this affection. It is, it seems to me, a general febrile or inflammatory disturbance, concentrating its greatest force upon some part of the oral cavity, invited or directed, without doubt, by the irritability therein existing,—proof of which inference lies in the fact that in nearly every case we find inflammatory complications, such associated inflammations being most frequently found in the lung-tissue. I take it for granted that the oral concentration saves some other more important part.

Gangræna oris, where it does not too quickly kill and separate its eschar, affords support to parasitic fungi; the oidium albicans, as in the other forms of aphthæ, being that most frequently met with.

Oral gangrene varies, as would be inferred, in degree; thus, commencing as a single canker sore, or epithelial degeneration, and terminating with no very serious result, it might be described as the follicular, or other of the simple species. Concentrated, or in its malignant form, it destroys life without affording the physician any extended chance to combat with it. In healthy children gangrene is very uncommon, the ordinary canker being generally the worst manifestation. In children exhausted under the exanthems, in those maltreated with mercury, or laboring under a syphilitic degeneration, the marked or destructive type is exhibited.

The decomposition of mucus, or the débris remaining from the food, when lodged upon an aphthous sore, forms the best nidus for the development of fungi—it is, as it were, a soil—and it is undeniable that epithelial scales in varying states of abnormal degeneration, inspissated mucus, and particles of decomposed food are common to all such sores. Thus, in sickly children, the fungoid association is most common from the fact of the weakened energy of the parts afflicted; this, favoring decomposition and the retention of the débris in the cavity of the mouth, and consequently producing the required soil or habitat of the oidium, as alluded to.

In foundling hospitals, where the sucking-bottle is used, the spores of fungus find an easy passage to the mouth, being in this way located and developed. In the nursing infant of an uncleanly mother, the accumulation and retention of the milk will, with favoring atmospheric influences, quickly develop fungi. It is the fungus and not aphthæ that is contagious, as must be plainly seen; hence one can but wonder at the disputes of Guersant, Billard, Valleix, Duges, and others.

Review.—Having thus expressed my own views of aphthæ, committing myself to the admission that I fail to distinguish it as any special disease, I may, with perhaps a greater justice to the subject, present the opinions of others whose extended observations and judgment have long held them in the light and position of authority. Trousseau and Delpech both describe the aphthæ as being sores with the materies morbi deposited beneath the epithelium. Bamberger (*Krankheiten der Mund und Mundhöle:* see Virchow, *Archives*) controverts these views, and explains the presence of the soormasse by the fact that it has insinuated itself between, among, and below the epithelial particles.

If we take, says Professor Bamberger, the soormasse, and place it under the microscope, we find it made up almost exclusively of

epithelial scales, old and young, the débris of the food, and of inspissated mucus, which last is probably only a condition of epithelial formation. The color of the mass is not to be hastily judged, as this might have been influenced by the débris of the mouth.

"Upon these sores, however, very quickly appear a peculiar organization, which consists of round and oval spores which stick to each other, and in this way form a more or less ramifying series of threads. The longer the sore continues, the more marked is its penetration by these threads or spores. This new organization, or fungus, can never, however, originate or be generated by the organism itself, but is always the result of germs coming from outside sources. It is not peculiar to a particular sore, though it occurs most frequently on those of a certain order. Besides the two constituent parts, epithelial scales and fungus, there appears sometimes a third constituent, in the form of granules or granulated matter.

"From this," continues Professor Bamberger, "we see that aphthæ cannot be counted among the products of inflammational and exudational processes, as so frequently considered; the microscope has failed to discover an exudational appearance; also, there is wanting the anatomical and clinical appearances of inflammation. True, it may be that it is found in association with a catarrh, but this is an accident, just as one may not say that the diarrhœa so frequently found in connection with the sore in the infant is the cause of the sore, as he might not say that the sore is the cause of the diarrhœa. There is, in aphthæ, no ulceration, the soormasse being capable of being peeled from the surface."

Professor Dewees thus refers to the aphthæ as exhibited in the infant:

"This complaint is generally called the baby's sore-mouth: it consists of a greater or less number of white vesicles on the inside of the mouth. It very generally begins on the inner part of the lower lip, or corners of the mouth, and much resembles a small coagulum of milk. From this point it sometimes spreads itself very rapidly over the inside of the cheeks, tongue, and gums; and, at others, it will appear in the same form, and at the same time, on several portions of the mouth; as inner portions of the cheeks, etc. The French, especially M. Billard, make it a different disease from what they term 'muguet.' But, from a careful examination of the two diseases, I believe them to be the same, differing only in intensity. I think we have not the disease which he terms 'muguet,' or I do not understand his description: as far as I have been able

to compare them, they are identical. The difference may consist in the modification which a hospital may give it; if there be a difference, I think it must be owing to this cause. When this efflorescence is extensive, the child slavers very much, and is frequently embarrassed in its sucking; it cries, and evidently betrays that it is in pain; it is very restless and very thirsty, as it evinces by its frequent stirrings, and its disposition to be continued at the breast. The eruption in its mildest form is very white, and looks as if a stratum of milky coagulum were spread over the mouth. It sometimes confines itself to the center of the cheeks, at others to the lower lip, or one side of the tongue. In its severer forms the appearance of the eruption is of a dark-brownish color or extremely red, owing, most probably, to minute portions of blood; but both are evidently grades of the same affection, changed either by mismanagement, constitution, or the force of the remote cause.

"This affection is thought to be altogether of a symptomatic kind—or very rarely idiopathic. It is almost uniformly preceded by a deranged condition of the stomach and alimentary canal, and always, we believe, by some disturbances of the stomach itself. The brain always shows signs of participating in this complaint, as there is almost always an unusual inclination to sleep, though the child is frequently disturbed in its nap by some internal irritation, perhaps of the bowels themselves. This disposition to sleep is so well known to nurses that they will frequently tell you 'the child is sleeping for a sore-mouth.' The bowels are often teased by watery, acrid stools, of a greenish color; their discharge is frequently attended with the eruption of much wind, and, to judge from the noise, it would be supposed there was a very large discharge of feces, though, upon examination, it is found to be very sparing.

"The alvine discharges are frequently very acrid, so much so, sometimes, as to excoriate the verge of the anus and nates very severely; especially when due attention is not paid to cleanliness or to the frequent changing of the diapers. But this never takes place until the disease is pretty well advanced, and has made some progress; it is generally pretty well spread over the mouth, and always shows a violent disease. The stomach is also sometimes much deranged; vomiting the milk very soon after it is received into the stomach, in the form of a dense curd, mixed with a porraceous mucous substance. If the milk be not voided by vomiting, the stomach constantly discharges, by eructations, a gas with a very sour smell. The child, when the disease is severe, soon be-

comes debilitated, and rapidly emaciates; it is almost constantly harassed by severe colics and profuse diarrhœa; its stomach will scarcely retain the little it can swallow; and the œsophagus sometimes becomes so loaded with aphthæ that it can no longer transmit the small quantity which is reluctantly admitted into the mouth; and the child dies, either from the exhaustion consequent upon the profuseness of the discharges from its bowels, or from inanition.

"It is a popular belief that this aphthous efflorescence passes from the mouth through the whole tract of the alimentary canal to the very termination of the rectum; and the excoriation at this part is offered as evidence of the fact. Whether this be true or not we do not know, for we are not in possession of any facts from dissection which decide the point. We once examined a body which certainly died from aphthæ, the examination of which would by no means tend to confirm this common belief. A child, on the tenth day after birth, was observed to have a number of white spots upon several different portions of its mouth, which rapidly spread over its whole surface. It had the usual premonitory and accompanying symptoms, which increased daily in severity, in spite of every effort to oppose them. It was a feeble, weakly child, of a consumptive, feeble mother. Its sufferings were very great, though under some control from laudanum, so long as it could be taken by the mouth, or retained by injections—coat after coat of aphthæ was thrown off, and each new crop appeared to be more abundant, and less amenable to remedies, until at last, at the end of two weeks of severe suffering, the poor infant could not swallow a drop of the thinnest fluid. Injections of bark and mutton-tea, in conformity with popular opinion, were resorted to, but all in vain; the child, in a few days more, died from absolute starvation, or, at least, the catastrophe was certainly hurried by the impossibility of receiving nourishment.

"We examined the body after death: we found the whole tract of the œsophagus literally blocked up with an aphthous incrustation, to the cardia, and there it suddenly stopped. The inner coat of the stomach bore some marks of inflammation, as did several portions of the intestines; but not a trace of aphthæ could be discovered below the place just mentioned. This case would, therefore, create a doubt whether this affection besieges any other parts of the body than those just stated, namely, the mouth, posterior fauces, and the œsophagus to the cardia, since, perhaps, none could have been of greater severity; but it is with us a solitary case, and should not be received for too much. Dr. Heberden says, 'The aphthæ are sup-

posed not only to infest the mouth and fauces, but to be continued down through the whole intestinal canal. In two who died of lingering fever, and whose mouths were covered with aphthæ, which hung in rags all over it, there was not the least trace of them that could be found in dissection beyond the fauces.'* The excoriations about the anus can certainly be accounted for, without the presence of aphthæ to produce them; in bad cases, the stools are always extremely acrid, and the parts over which they constantly pass and spread are, at such a tender age, very delicate, and very readily excited to inflammation.

"Dr. Good seems to admit, without hesitation, the transmission of aphthæ through the intestinal canal; for he says, without reserve, 'The fauces become next affected, and it descends thence through the œsophagus into the stomach, and travels in a continuous line through the entire course of the intestines to the rectum, the feces being often loaded with aphthous sloughs.'†

"We are afraid there is too much taken for granted in this account; we know of no decided evidence of the fact, nor does Dr. Good name any authority for the statement. The case alluded to was certainly one of death from aphthæ; but in it the aphthous efflorescence stopped at the cardia. Is it probable that any child could survive this affection did it travel the whole course of the intestinal canal? We think not—yet aphthæ is rarely a dangerous disease in infancy. Dr. Good's description of this affection would certainly lead to the conclusion that it is the ordinary march of the disease to pass through the bowels and manifest itself at the verge of the anus. This point is far from being settled in the minds of pathologists: even the French are far from having ascertained it with certainty—it is true, M. Billard says he has seen evidences of it in the large and small intestines, as well as the stomach; but there is no mention of it lower than the ileum.

"Now, this cannot be so; since it is in violent and long-protracted cases alone that the anus discovers any signs of irritation from this cause, which would not be the case were Dr. Good's account correct.

"Dr. Good and others suppose that aphthæ communicates itself by

* Commentaries, p. 31. "It is well known, too, that in *small-pox* no pustules are traced beyond the pharynx and larynx, even in the most severe cases, when the mouth and tongue are thickly covered with the eruption."—*Tweedie's Illustrations*, p. 65.

† Study of Medicine, vol. ii. p. 391.

a specific contagion,* and gives as evidence, the excoriations of the nurse's nipples. We do not hesitate to believe there is a discharge from these little pustules which may be highly acrimonious to the denuded skin, but we think this is perfectly innoxious to a sound one. For we have never seen sore nipples produced by aphthæ, where the skin of these organs was perfectly sound. That they aggravate the tenderness and inflammation, when these parts are tender and abraded, we admit, and so would any other acrid substance, without having recourse to the belief of a specific contagion. If this were the case, why do not the lips of children laboring under this affection, betray its influence?

"That this complaint is occasionally epidemic, there is every reason to believe; and this circumstance, among some others to be mentioned, renders the opinion so commonly credited (of its being a sympathetic affection), very questionable. We have always considered aphthæ as arising from some peculiar condition of the stomach; but, from some late cases, and more mature reflection, we think it may be otherwise. Our reasons for *doubt* are,—

"1. We have recently seen this affection in two cases where the stomach and bowels were in the most perfect order before the eruption, but became disturbed a little during the progress of the disease.

"2. That this complaint has been very often removed by topical applications alone, where the efflorescence has been very considerable, and where there was no remedy of any kind addressed to the stomach and bowels.†

"3. That we do not uniformly see this complaint where there has existed great disorder of both stomach and bowels, and these of a permanent kind.

"4. That, however the stomach and bowels may be disturbed by acidity or other inconvenience, or however long these may continue, if the child has had this complaint, it is not renewed, though the individual is not exempt from a second attack, like measles or small-pox; for, in certain chronic affections, they may be again visited by aphthæ.

"5. That this affection is sometimes epidemic, as stated above; for Dr. Good informs us that not only all the children of the same family, however cautiously separated from one another, but many of

* M. Billard declares it not to be contagious.

† QUERY.—Is then the unconquerable diarrhœa, sometimes present, a mere accident, or would it not be more easy to account for it by the presence of aphthæ?

those of the same neighborhood, have been known, at times, to suffer from it simultaneously. (Vol. ii. p. 391.)

"6. That this disease is almost always ushered in by some cerebral affection, as great drowsiness or watchfulness; the first is by far the most common.

"7. That other portions of mucous-membranes are liable to the same kind of eruption, without the condition of stomach or bowels being instrumental in its production; for we have seen it most plentiful within the labia pudendi, as well as on the internal face of the prepuce.

"These facts have made us lately question the sympathetic origin of aphthæ; yet we admit they are not altogether conclusive in our own mind; but we thought it proper to suggest the possibility of its being an idiopathic disease of the mucous membrane.

"This affection is not confined to early infancy; it shows itself in the more advanced periods of childhood, and from that to any period of human life. It is sure to attend the last stages of almost every long-protracted disease, especially those which may have wasting discharges; such as phthisis pulmonalis, dysentery, or diarrhœa; and when it does appear, it is almost sure to be a fatal harbinger.

"This disease is not essentially accompanied with fever; if it accompany any chance affection which is attended by fever, we do not find it to heighten the existing one.

"Weakly children, and especially those born before their full period, are more obnoxious to this complaint than the robust and those who have tarried to their full time in the uterus—the children of weakly women, and particularly those who make bad nurses from scarcity of milk, or from its not being of a sufficiently nutritious quality, are more disposed to this affection than the children of hale women, who have plenty of nourishment of good quality. The children fed much upon farinaceous substances are especially exposed to the attack of this disease, particularly when their food is sweetened with brown sugar or molasses."

In the work by M. Jourdain "On the Surgical Diseases of the Mouth" is a chapter on aphthæ, so unlike all that precedes it, as connected with modern pathology, that I cannot but think the book owes the presence of the chapter to the translator rather than to the author.

"The term aphthæ," says this work, "is used alike by ancients and moderns, but in quite a different acceptation. The former define aphthæ as superficial malignant ulcers, attended with heat, occur-

ring especially in infants, and not confined to the mucous membrane of the mouth. It is at the present day universally applied to those whitish pustules which appear on the mucous membrane of the mouth, and sometimes of the adjoining parts. Inattention to this difference has led many to apply to the latter disease a treatment based upon the definition of the ancients, whereas the two are palpably different.

"Aphthæ have been regarded as ulcers; but ulceration implies solution of continuity, whereas in true aphthæ there is no erosion or decrease of substance, but, on the contrary, an increase; desquamation of the aphthous crust leaves no trace of cicatrization. Theorists speak of white, red, and black aphthæ, according to the nature of the generating humor; but during a long practice I have never seen them of any other color than white, whitish, or, especially when of an unfavorable character, ash-colored.

"They commence by small white spots, usually on the uvula, thence spreading, sometimes over the veil of the palate, sometimes over the tongue, gums, and inside of the lips and cheek. Often they spread still further into the pharynx and œsophagus. Of their extension beyond this we cannot, of course, have the evidence of sight; but we have other and unequivocal symptoms, which prevent us from regarding as an absurdity the idea of their presence in the œsophagus, stomach, and smaller intestines; as, for instance, in the difficulty of breathing and deglutition; also in the appearance of the discharges from the stomach and bowels, so frequent in aphthous disease.

"The description of aphthæ is easier than their etiology. We maintain that they depend in all cases upon the same cause, differing, indeed, in degree of intensity, but never in its nature. We therefore differ from those who assign one cause in adults and another in infants. Nor can we agree with the many who make them to arise from excess of serum or of acid in the milk or nourishment given to the infant. The depleting, purging, and starving treatment based upon this hypothesis is most pernicious; moreover, experience tells us that this very acidity or astringency of aliment will frequently cure aphthous eruptions, or prevent them from coming to maturity; and a serous flux, determining to the mouth, has caused the complete disappearance of existing aphthæ.

"What, then, is the true origin of this disease? We believe it to be found in the existence of a slow and imperfect *crisis*, and to arise from a sulphurous humor generated in the larger vessels, and

determining to such parts as are, by position or structure, most impressible. Observe for a moment the circumstances and character of aphthæ. In all fevers, in the young and in the vigorous, their appearance is ever preceded by a crisis more or less distinct, and, according to the violence of the primary disease, marked by more or less severe symptoms. In one case nature struggles successfully with the acrimonious morbific principle, a favorable crisis occurs, and an aphthous eruption brings great relief to the patient; in another case this morbific principle is too abundant, obstinate, or malignant,—no crisis occurs,—no aphthæ,—nature succumbs, and the patient dies. Again, we have aphthæ through the critical transfer of morbid action from some more or less vital and important organ. In some cases the change proves salutary; in others there is a reaction, the aphthæ disappear, and if the *vis vitæ* be not destroyed, it is often greatly endangered.

"Aphthæ rarely occur in a perfect and favorable crisis, but rather, as we have before said, in those which are slow and imperfect, such as are met with in a great number of diseases. Thus we find some aphthous eruptions of not only days', but weeks' and months' continuance. When, for instance, necessary evacuations have been neglected in the onset of disease, and a cachectic plethora has supervened, the cure is slow and incomplete without the occurrence of aphthæ. Diuretics and gentle enemas aid the recovery; blood-letting and purgatives retard it: the aphthæ disappear after fulfilling their sanative purpose, and the patient feels perfectly relieved. Experience, however, shows that the danger is not quite over; some lurking matter may take fresh increase, give rise to new aphthæ, in default of other means of escape from the system, and greatly endanger life; this may happen twice, thrice, or oftener.

"The causes or antecedent symptoms of aphthæ may be mild, and recovery take place without any or with very simple treatment; or they may be severe and lamentable, ending in suffocation, delirium, or obstinate diarrhœa. This difference we find explained by the varying state of the humors; at one time being crude, and by consequence irritating, at another time matured or concocted, by which process of concoction the more hurtful principles are expelled,—a process aided in some inexplicable manner by the continued circulation of the animal spirits. Thus it happens that the aphthæ of seventh-day crises are usually more unfavorable than those which follow crises of a later date, when the morbid matter has had time to undergo a thorough concoction.

"Although aphthæ are most generally preceded by febrile miasmata, they are not necessarily so. I have seen cases, both among adults and infants, in which they have been neither preceded nor attended by fever. In infants we may properly suspect impurity of the mother's blood.

"Certain evacuants have been found more hurtful than beneficial in the treatment of aphthæ. This comes from a forgetfulness of the excellent advice of Hippocrates, who tells us to have regard, in the choice of depleting agents, to the channels of evacuation which nature points out in any given case. Now, the vessels concerned in the critical discharge of an aphthous eruption are the lymphatic rather than the venous or arterial vessels. Therefore to the changes of the lymphatic fluid, rather than to those of the blood, is our attention to be mainly directed in the management of this disease. We have frequent evidence of serous or lymphatic engorgement at the outset of aphthous eruptions; in the fever, stupor, and restlessness during sleep,—indicating a fullness of the head and an acrimony of the humors.

"Aphthæ are more common in some countries than in others, which explains the almost total silence of some writers respecting them. This depends upon difference in climate and mode of living. In warm countries their course is rapid, from the increased perspiratory action of the skin. But in colder latitudes, where the food is coarser, the habit of body denser, and the humors thicker, their progress is slower, because the secretions of the system generally are more liable to obstruction. In these countries, especially, all discharges which tend to arrest perspiration, such as hemorrhoidal, intestinal, or uterine, whether occurring spontaneously or artificially provoked, are very unfavorable in the treatment of aphthæ. On the contrary, a copious cutaneous or urinary secretion forms often a favorable crisis. This agrees with the doctrine that aphthæ are essentially serous, and most readily cured by a free discharge of serum or lymph. The cause of endemics we leave others to explain; each country bears in its womb the seeds of its own diseases, and also the means for their cure. External agencies may cause aphthæ, not, as the ancients supposed, by their direct action on the mouth, but indirectly, through the mass of the circulating fluids.

"The diagnosis of aphthæ is easy; not so the correct interpretation of their premonitory symptoms. Painful deglutition, dryness of the mouth, a thick, husky voice, heat of the stomach, with rumbling noises, disturbed, unrefreshing sleep,—these often precede aph-

thous eruptions. Urinary symptoms are not to be relied upon, though often useful in prognosis after the appearance of the eruption. In the different forms of fever, the obstinacy of the disease is often a precursory symptom; when, notwithstanding the intestinal, urinary, and other evacuations, there still exists great depression and embarrassment of the vital functions, the appearance of aphthæ will often in a single night bring calm and relief to the patient, as experience has abundantly testified. The physician should follow nature's hint, and seek to aid in the cure of the disease through the same channels. The above symptoms, be it understood, are by no means necessarily followed by aphthous eruptions.

"We should be careful in our prognosis: where the system is not weakened, the pre-existing morbid matter well concocted, or the extent of the eruption limited to the palate, we may anticipate a favorable issue. But if the patient be in a reduced and weakened condition, the morbid matter crude, or the aphthæ covering the entire membrane of the mouth and pharynx, the disease is much more to be feared. Again, suppression or derangement of the menstrual flux is unfavorable, from its tendency to draw the eruption from the place where alone it can properly mature. Profuse alvine or hemorrhoidal discharges are also hurtful; also any catarrhal attack falling upon the throat, causing the sudden disappearance of the aphthæ. Aphthæ occurring in diseases, at the onset of which there was insufficient evacuation, are grave and dangerous. The disease may occur in persons of either sex, and be of tedious duration; but when the appetite returns, not only is the food highly relished, but it gives, by its new nourishment, relief and salutary benefit."

"The term aphthæ," says Prof. Wood, in his Practice of Medicine, vol. i. page 501, "was employed by the ancients to signify various inflammatory affections of the mucous membrane of the mouth. Willan proposed to restrict it to a peculiar vesicular eruption upon the membrane, but committed the error of confounding with this affection the thrush of early infancy. The two complaints are quite distinct, and should not be similarly designated. Aphthæ, in compliance with very general custom, is extended to all those small ulcers, with whitish surface, which so frequently appear in the mouth, whatever may be their origin. The most frequent source of aphthæ is probably the vesicular eruption occasionally present in erythema. The vesicle is small, oval, or roundish, white or pearl-colored, and consists of a transparent serous fluid under the elevated epithelium. In a few days the epithelium breaks, the serum escapes,

and a small ulcer forms, more or less painful, with a whitish bottom, and usually a red circle of inflammation around it. The vesicles are sometimes distinct and scattered, sometimes numerous and confluent. The distinct variety, though painful, is a light affection, continuing in general only a few days or a week, and is usually confined to the mouth. It produces little or no constitutional disorder, though it may be associated with fever and gastric irritation as an effect. It attacks equally children and adults, but is said to be very common in early infancy. In adults it is frequently occasioned by the irritation of decayed teeth. The confluent variety is much more severe and obstinate. This frequently extends into the fauces and pharynx, and is said to reach even the intestinal canal, though it may be doubted whether the affection of the stomach and bowels is identical with that of the mouth."

The French fail in distinguishing, with Prof. Wood, the difference between the pultaceous inflammation of thrush, or muguet, and the aphthæ, calling muguet the "aphthes des enfans." They recognize also that there are variations in the expressions of the condition, making a distinction between the *muguet bénin ou discret*, and the confluent, *muguet malin ou confluent.*

In Clymer's Aitken's Science and Practice of Medicine, the subject is thus alluded to: "Follicular inflammation of the mouth, follicular stomatitis, aphthous stomatitis, or aphthæ of the mouth, is a disease which usually commences as a simple stomatitis; but very soon small, round, transparent, grayish or white vesicles appear, and at the base of each is an elevated marginal ring, which is pale and firm. Fluid soon escapes from the ruptured vesicle; an ulcer forms, which spreads, bounded by a red circle and an elevated border. In some forms of the affection microscopical parasitic plants appear."

Treatment.—If we are content to view aphthæ simply as a fungous sore, originating from and maintained by the presence of a parasite,—the oidium albicans,—we would find a most admirable application in carbolic acid, admitting that the parasite had an external relation only; if, however, these spores come from within and are exudational, such local treatment would stand us alone to a very temporary end.

Viewing the fungus simply as an accidental parasite external in its relations, our attention is directed primarily to the necessity for cleanliness, and the avoidance of all positions, locations, and circumstances favoring the development of fungi; carbolic acid, acid nitrate

of mercury, sulphuric acid, nitrate of silver, or chloride of zinc, will be found destructive to the parasite, and, of necessity, if the circumstances are changed, equal to the production of a permanent change in the appearance of the part; that is to say, the application is equal to the removal of the envelope or cover of the disease, but, except by a happy accident, will not beneficially affect the underlying condition or the disease proper.

In the treatment of aphthæ, the practitioner finds himself compelled, at the very outstart, to consider the constitutional associations. Occurring in connection with acute diseases, it is generally the case that the local expression is found to disappear with the condition exciting it. Thus, in febrile attacks attended with stomatitis, we direct our remedies to the causes inducing such attacks; as the functions become harmonized and regulated, the expressions of the irregularity disappear.

Aphthæ, whatever its form, appearing in connection with the dyscrasic diseases, gives to the practitioner the greatest anxiety and trouble. In our anticipations of what we are to do, we are not to forget that the task before us is the removal, or, at least, the marked amelioration, of the constitutional disease. If this should be syphilitic, tubercular, or cancerous, the magnitude of the task is evident: hence it is that patients are allowed so frequently and so unnecessarily to find themselves subjected to a series of disappointments.

Acute aphthæ, as manifested in cancrum oris, gangræna oris, and follicular inflammation, demands not unfrequently the most attentive local treatment. This treatment has, however, nothing particularly special in it, and, without doubt, must be appreciated from the general expressions of the subject. Alteratives and soothing applications are such as would naturally commend themselves. Sulphate of copper, in proportions varying from five to thirty grains to the ounce of water, is an excellent application. Iron and quinine in combination is used to great advantage, twenty-five grains of the latter to one drachm of the muriated tincture. A powder made by combining equal parts of red bark, chalk, and tannic acid is frequently found very serviceable. Solutions of alum, and the tinctures of capsicum and myrrh, are useful in their places; also borax, oxalate of cerium, powdered chlorate of potash, sulphate of iron, etc.

Where the parts seem angry and irritable, or phagedenic, combined with these applications are to be employed the more soothing means: starch, gum, and slippery-elm water are very serviceable. Tincture of hamamelis, much diluted, is a good preparation. It is

to be understood that while the principles which govern the treatment of the aphthæ are common to the species, the applications must vary to meet peculiar indications. The ordinary white sores, for example, need little more in the way of a local treatment than the continued application to them of some of the agents mentioned: which one would be best, or, indeed, what would be best, we could not well say, unless considering a particular case. The local treatment is not, however, in any of these cases urgent, and it is the general experience that we find ourselves trying first one thing and then another; indeed, it is unfortunately too common that we are soon brought to the conviction that any local application is unreliable enough,—not that we cannot cause a sore to disappear, but that to-day, to-morrow, or next week, another comes to take its place. Canker sores seem periodic in some persons; they come without perceptible cause other than what seems a persistent constitutional condition, defy all treatment, and finally disappear of their own accord.

Of the special conditions, thrush demands that the bowels should be kept free from costiveness,—oil, the saline cathartics, or aloes being employed as indicated. Where fever attends the local manifestation, it is well to prescribe the neutral mixture made by fully saturating lemon-juice with the carbonate of potassa; or, if more agreeable to the patient, the ordinary lemonade may be used. In diarrhœa, which is so frequent an attendant on thrush, some such combination as the following may be used:

R.—Hydrarg. chl. mit. gr. ij;
Pulv. opii,
Pulv. ipecac. āā gr. i;
Mag. carb. gr. xii. M.
Ft. chart. No. xii.

Of these powders, the infant may take one, mixed in molasses or other vehicle, every two hours, until the discharge is checked or until the twelve are taken. In diarrhœa with green discharges it may be sufficient to use the magnesia alone, or lime-water, which is more convenient of exhibition, may suffice for the correction of the acidity: this latter can be rendered palatable by combination with some of the aromatic waters. In cases associated with much intestinal disturbance, it will in most instances be found satisfactory practice to combine laudanum or paregoric with olive or cas-

tor oil, administering in such doses as accords with the age of the patient. A child one year of age may take three drops of laudanum or twenty of paregoric, combined with a teaspoonful of the oil; for an adult a dose would be twenty-five or thirty drops of laudanum to a tablespoonful of the oil. It is also found useful to drink freely of the demulcent waters, marshmallow and gum arabic being among the best of these. In debility—and this is by far the most frequent of the conditions—combinations of iron and bark, conjoined with the most nutritious articles of diet, will be found indicated: ferrated elixir of cinchona is a pleasant and very reliable preparation, and is freely taken by children. The dose for an adult is one teaspoonful, repeated three or four times a day; to an infant a year old, ten drops may be given.

Concerning the diet, if the patient is beyond the age of infancy, it will be found that the richest food is most advantageously received; juicy beef, oysters, malt liquor, wine, etc. being freely allowed. In the infant, the character of the milk of the mother is to be examined: in many cases it will be found needful to furnish a different nurse, or, otherwise, wean the child. Many cases of persistent thrush in the infant have quickly disappeared after a change of nurses.

Gangræna oris, the most degenerative and destructive of the aphthæ, requires the most persistent vigor in the treatment, both as regards systemic and local conditions. Sulphate of quinia and the muriated tincture of iron are, in the first direction, most to be relied on. This condition occurs most frequently between the periods of first and second dentition, and is, without doubt, more common to the miasmatic than to other regions, excepting always the location of ill-kept and ill-ventilated charities. Gangræna oris may have a local excitant, but it is never without a constitutional predisposition: it may commence as a simple sore, gradually degenerating, or, as in carbuncle, destruction may reside in the primary impression. A common form of sloughing stomatitis is its appearance as a whitish or ash-colored eschar situated upon the gums, lips, or cheeks. This eschar quickly falls out, being followed by degeneration of the associate parts; the breath becomes offensive, the saliva flows as in ptyalism, while, to add to the discomfort, the ulcer pours out an acrid, corrosive fluid, which not only excoriates the mouth, but seems to provoke the extension of the mortification. If not checked, the ulceration extends to the bone, quickly involving it in the general destruction, and bringing on the condition of necrosis,—necrosis

infantilis, as the disease is, unfortunately, so frequently compelled to be named.

The treatment of gangræna oris is precisely that of a carbuncle. We endeavor to circumscribe the action by sloughing out the affected part with the aid of caustic; this accomplished, we stimulate the general system, correct, where possible, all functional disturbances, and use for the relief of the local sore such soothing means as seem indicated.

CHAPTER XXXIX.

RANULA.

The subject of ranula is one easily comprehended. A ranula is the analogue of the sebaceous tumor, being simply a collection, the result of the closure of a tube of outlet. The tumor thus designated is found principally beneath the tongue: it is generally a translucent swelling, varying in size according to the length of time it has existed, at times being observed when not larger than a pea, at others so great in bulk as to throw the tongue back into the fauces. I have seen a ranula which filled the whole oral cavity; but such dimensions are uncommon.

Recalling the anatomy of the salivary glands, we remember that the submaxillary, situated beneath the jaw, has the outlet for its secretions in a tube opening at the side of the frænum linguæ,—the duct of Wharton, as it is called. The lingual gland empties itself on the same line. The parotid, by its tube, the duct of Steno, opens upon the mucous face of the cheek opposite the superior second molar tooth. While patulous, these tubes convey into the mouth the secretions of their respective glands, and thus the saliva, passing to its recremental purpose, is disposed of.

If we were to tie or otherwise obstruct one of these tubes, it would be natural to expect that the secretion accumulating back of the ligature would expand and bulge out the duct into the form of a tumor. This is the very simple history of the formation of a ranula.

Ranula, thus provoked and thus formed, varies much in appearance and character. In one case it will look and feel almost precisely like the belly of the frog, the enveloping cyst being thin and attenuated. In another instance the walls are thick. The contents present varying characteristics, being watery, or semi-solid, or solid, even to the hardness of stone, as illustrated in the very instructive case cited in the chapter on Salivary Calculus.

A ranula, the contents of which are watery, implies, as a rule, that

the disease has been of short existence, the contents being simply the secretion from the gland unchanged in character. In the ranula of semi-solid consistence an explanation is found in the partial absorption of the more fluid portion, leaving an inspissated mass. In the solid ranula the encystment is the common salivary calculus, —precisely the same as is found upon the sides of the teeth, excepting in the absence of the common débris of the mouth. Such a ranula will be found to be of long standing: absorption of the watery portion has gone on until what remains is the lining portion of the secretion.

A thin cyst implies a rapidly-formed tumor unattended by vascular excitement, the envelope being a simple attenuation of the walls of the duct and overlying parts. This form of ranula very frequently ruptures and thus effects a self-cure. Cysts, thickened and hard, imply a tumor of slower growth and the association of vascular changes resulting in the effusion within the cyst-wall, and the organization of a greater or less amount of lymph. Cysts thus thickened may compose the principal bulk of a ranula, the cavity being very small in comparison.

A ranula gives trouble from its bulk and location alone, seldom or never degenerating. It does not seem true, either, that harm results to digestion from the loss of the secretion, such loss, indeed, being more apparent than real, the associate glands performing excess of work. A ranula attaining great size would necessarily intrude upon all the surrounding parts, thereby provoking secondary lesions which might very well prove of more serious character and consequence than the original disease: thus, cases are on record where the teeth have been forced from their sockets, where large ulcers have been formed against the inner face of the lower jaw, where necrosis of extensive character has been provoked, etc.

Treatment.—This, in principle, consists simply in opening the tumor, evacuating its contents, and so conducting the cure of the wound that it shall not entirely close, securing and preserving, in this way, an orifice of exit for the secretion.

In the rana, or frog-belly tumors, it is found sufficient to catch up with the tenaculum or forceps a portion of the sac, and with the scissors or bistoury cut it off: the edges are then to be cauterized, and the case left to nature.

In the thickened cysts, such an operation as just suggested might not be easy to accomplish. In such a case, take a strand of ligature wire (silver is to be preferred), double it upon itself some half-dozen

times, to the extent of the supposed thickness of the sac of the tumor to be operated upon. Take next the continuation of the length of the wire, and closely, yet spirally, bind with it the thickness just secured by the half-dozen reflections. Next take a curved needle, and thread the wire to it. Now pass it through the tumor, entering at the center. When the thickened part of the wire—which is to be bulbed by a perforated shot compressed on its extremity—is brought in contact with the cyst, it is to be let in by an incision just large enough to allow the passage; pull it now in, until checked by the shot; fix the needle-end so as to retain the thickened end in place, and the operative part of the proceeding is completed.

If, when making the little section for the passage of the wire, the contents should not at once escape, they are to be pressed or syringed out. If the parts seem particularly indolent, there is no objection to the introduction of a stimulating injection. The presence of the wire will, however, in ordinary cases prove sufficiently provocative of the desired action. Iodine in tincture may be used externally over the face of the tumor. As the size of the tumefaction gradually diminishes, the thickened end of the seton is to be kept in place by attention to the fixing, or single-strand, end.

In a ranula holding a calculus within the cyst, nothing is to be done without using the knife, except, indeed, in certain occasional cases where the orifice of the duct has become patulous and the stone can be seen or felt. In these cases the operator may succeed in drilling or breaking them in pieces, and thus securing their removal. It is much easier, however, even here, to incise down to the stone, and thus take it away. The case alluded to as mentioned in the chapter on Salivary Calculus is as good a study as could be given in the direction.

All cysts or tumors found beneath the tongue are not, however, to be esteemed as being of the character just described. Inflammation of the sublingual gland is not unfrequently met with, and the tumefaction is, at times, so considerable as to very closely simulate ranula. Cysts within the substance of the glands, not salivary in character, are other of the conditions met with, and these more closely simulate the ordinary ranula than the first; particularly when the cyst is simple. Papillary indurations are sometimes met with in the same situation.

A singular case operated upon by myself, and where I very nearly lost the patient, occurred in the person of a confectioner, and has the following history:

First it was noticed that the parts beneath the chin began to soften and grow broad, freedom of motion was lost in the jaw, and a slight sense of difficulty was experienced in speech, as the result of stiffness about the tongue, the mucous floor of the mouth being quite indurated. In the course of four months a tumor, evidently cystic, and fully the size of an ordinary orange, occupied the front of the neck, but happily concealed by the long and heavy beard of the patient.

Presenting himself for an operation, a diagnosis was secured through the aid of an exploring needle. This valuable instrument revealed not only that the tumefaction was a cyst, but gave some idea of its contents.

The operation for the cure was performed by making a reasonable incision directly in the median line of the neck, passing into the cyst. The contents, a great mass of lymph-like matter, filling a large glass, issued as a continuous rope; in color and consistence it was like thin calves'-foot jelly. Washing the cavity thoroughly with warm alum-water, compresses were carefully adjusted to the parts and sustained by a bandage passing over the forehead. In two weeks, and without any trouble, the parts seemed to have united, and the cyst to be obliterated.

One month later the patient again presented himself. The tumor was rapidly reforming: the cyst had evidently not been destroyed. It was now the size of a walnut. A few days later a second operation was performed, precisely as in the first instance. The contents of the tumor differed, however, at least in color, having the same colloid consistence, but being blood-red. After an incision, determined on obliterating the cavity, I syringed it with the officinal tincture of iodine, undiluted, stuffing the cyst loosely with cotton. I this time succeeded in producing a perfect cure; but the swelling resulting from the inflammation was so great that it was only by leeches, cathartics, and diaphoretics, conjoined with the closest attention, extending over a period of four days, that I succeeded in saving the life,—for two whole days the patient being unable to swallow even teaspoonful measures of water, and breathing with the greatest difficulty.

What was this tumor? Evidently a hydro-hematocele, the starting-point of the lesion being, I think, in a sublingual gland. It might be suggested that, had it belonged to this gland, the swelling would have exhibited itself more in the mouth. My reason for inferring that it was so situated lay in the fact that a blunt probe passed into the

cavity could readily be felt in the position of the right of these bodies on the floor of the mouth.

A case very similar to this, and of great interest, is recorded in Bell's Principles of Surgery:

"A young woman of Berwick whose native peculiarity of accent had received a singular aggravation by such an uncouth obliquity and imperfect motion of the tongue as conveyed the notion of her attempting to chew and turn each vocable with her tongue before she proceeded to swallow it, in place of uttering it.

"This was produced by a tumor of very great size, and of an appearance so peculiar as plainly to denote its character. It consisted in a vast collection of matter in the sublingual gland; and as that gland is covered by the whole thickness of the tongue within, and by the mylo-hyoidei muscles without, and bounded by the line of the jaw-bone, it had the following singularities of character. It could not be distinguished as a tumor, but had rather the appearance of a general swelling of the lower part of the face, jaw, and neck, such as often accompanies severe toothache or mumps. Upon laying the hand upon the outside of the neck, below the lower jaw-bone, the whole hand was filled with a swelling, apparently solid, but so little convex or circumscribed as to resemble in no degree the tumor of any particular gland, and yet so limited and so firm as not at all to resemble the general tumefaction proceeding from toothache. Upon introducing the finger into the mouth, you found the tongue raised, turned edge uppermost, and pressed entirely toward the left side of the mouth, the external tumor being upon the right side. Upon pressing the fingers very firmly down by the side of the tongue, and reaching from without, you could sensibly perceive not so properly a fluctuation as an elasticity, which implied the presence of a fluid; the tumor seemed elastic like a foot-ball, but with a degree of tension which made it seem almost solid. It was by comparing a variety of circumstances, especially the original place and slow growth of the tumor, that I confidently referred it to the sublingual gland. In this I had the advantage of the surgeon under whose particular care she was; but I did him the justice to send her back to him, again and again, expressing my opinion and my wish, at the same time, that he should do whatever he might suppose right. By good fortune, she called upon me the day she was to return home, nothing being as yet done to the tumor, but supplied with abundance of blisters and plasters to apply at a fit

opportunity to her throat. I felt now that professional ceremonies should give way to essential charities. I placed her in a chair, and almost without her consciousness, at least before she was aware, I struck a fine bleeding-lancet deep into the tumor by the side of the frænum of the tongue, when, from the firm compression of the surrounding parts, the matter, though too gross to pass freely through such an opening, was spewed out from the orifice, in a manner expressly resembling that in which yellow paint is squeezed out from the bladder upon a painter's pallet. It was of a deep-saffron color, thicker than mustard, mixed like gruel with seed-like particles, and exceedingly fetid. I knew that the tumor was not emptied, though the outward swelling was almost gone; but I also knew that though I should not enlarge the opening, the second secretion from the surface of the sac, which is in all cases thin, would dilute and wash out whatever viscid matter remained; and when she saw how suddenly my prognostic was fulfilled, she expressed a perfect confidence in whatever I predicted, and a perfect willingness to submit cheerfully to whatever I proposed to do. Next day I introduced the point of a probe-pointed bistoury into the orifice made by the lancet; and, knowing that the lingual artery lies on a lower level, imbedded among the muscles, and running along the lower surface of the tumor, while I had over the point and blade of my bistoury nothing but the inside membrane of the mouth, much thickened, I ran it fearlessly and at one stroke, as the less painful way, along the whole length of the tumor, when the thickest of the yellow mucus flowed freely or was raked out with the points of the fingers and the handle of the bistoury; and the tongue, descended now to its natural level, was in a capacity once more of delivering the peculiar dialect of her native city in all its purity.

"So tense and apparently solid was this tumor, in consequence of the compression by so many surrounding muscles, that her surgeon mistook it for a solid and strumous swelling. I reckoned that in this, as in all cases of sacculated tumor, the second secretion, which was thinner, would wash out the thicker mucus, and I was not deceived; but she left me too early for me to witness the obliteration of the sac.

"I find it, in all such cases, a matter of some importance, especially in a girl, to anticipate the outward suppuration of any sacculated tumor, by puncturing it, though to a great depth within the mouth and under the tongue, and equally necessary to be at pains in preserving the opening and obliterating the sac; a slight miscon-

duct in this respect occasions much distress to the patient, and much superfluous labor to the surgeon."

The salivary glands become occasionally the seat of inflammatory swellings, which are quite as apt to become indolent as to resolve. I have within my own observation several of these cases, and have been as many as six months in reducing such an induration. The submaxillary, however, seems the gland most disposed to take on these conditions, and the tumefaction thus produced is without rather than within the mouth, although it not unfrequently happens that it is first observed by the patient as a hard body on the inner side of the jaw.

Another form of tumor which might here be alluded to is found in the submaxillary triangle.

In dissecting down to the submaxillary gland, there will be exposed, when the body is uncovered by removing the superficial leaf of the triangular fascia, two lymphatic ganglia. These ganglia are very apt to indurate, forming sometimes a tumor of considerable size. I have met with them as large as a walnut. It is most common to mistake such indurations for hypertrophy of the gland itself. Two diagnostic signs distinguish them: they are not triangular, and they are not so solidly fixed as when the gland itself is the seat of the enlargement.

Illustrations.—By looking over and studying the clinical cases following, I think the general character and manner of treatment to be pursued in ranula and the kindred conditions must be fully appreciated.

"*Ranula.*—Operation by Dr. Hamilton. P. R. Cortelyou, House Surgeon.

"Dec. 13th, 1867. R——, of N., aged 16 years, private patient, admitted to Bellevue under Dr. Hamilton's care.

"Soon after birth his father noticed a swelling under his chin, near the median line, which has continued to increase ever since. Now the size of a large orange, nearly in the center, but inclining a little to the right side. It is not painful or tender; its surface is smooth and elastic. On exploration it was found to contain a thin yellowish fluid.

"Examining within the mouth, it was found to have lifted the tongue considerably; but its walls did not present the translucent appearance sometimes seen in ranula, nor could it be decided positively whether the orifices of the ducts, or the right side, were still open. It became a question what was the source of this enlargement or tumor.

"The term 'ranula' has been applied by some surgeons to obstructions of the sublingual ducts; by others to obstructions of the submaxillary ducts; and by most surgeons to obstructions of either the one or the other indifferently. Certain writers, also, have extended the term to all encysted tumors in this region, whether occurring in the areolar tissue or in muciparous glands, which present a common *external* appearance, like the throat of a frog.

"It was not very clear from which of these several sources this tumor had originated. It was decided, therefore, to proceed as if it were an obstructed duct. Accordingly, Dr. Hamilton made a small incision into the tumor beside the tongue, on the right side, avoiding carefully the ranine artery. This opening was at once enlarged by introducing a pair of bullet forceps and expanding them, so as to tear the wound larger. The sac was emptied, and a piece of laminaria digitata introduced. On the third day considerable inflammation existed, extending to the root of the tongue and side of the face. There had been also, up to this time, a constant but slight hemorrhage. Both the swelling and bleeding abated from this time. The contents of the sac were examined under the microscope, but not with sufficient care to determine their character.

"Feb. 1st, 1868, nearly two months after the operation, the father reports that the sac has almost disappeared. A little pus continues to discharge, and there is no tenderness or swelling. The laminaria is taken out daily, and replaced with ease. It is probable that the complete cure will not take place under several months.

"Dr. Hamilton mentioned that a ranula was said to form occasionally in a bursa outside of the genio-hyoid muscle; but he had searched for this bursa and could not find it."

"*Swelling of Submaxillary Gland from Inflammatory Obstruction of its Duct.*—Charles D. Hoyt, of Middlesex, Yates county, called upon Dr. Hamilton, December 29th, 1846, with a moderate enlargement of the right submaxillary gland, it being apparently, as felt beneath the jaw, of the size of a large Lima bean. He stated that this enlargement occurred about one week before, while eating his breakfast, and that in five minutes it attained the size of a 'walnut with its bark on,' and that it prevented his opening his mouth freely. After leaving the table he rubbed it for some time, and in half an hour it was reduced to its present size.

"From that time the same enlargement occurred every time he ate, and without any reference to what he ate. It enlarged most, however, while eating his first meal in the morning. By rubbing

alone could it be reduced. Chewing tobacco seemed rather to diminish than to increase its size. It was not tender, nor red, but when enlarged to its utmost it caused a severe pain, which extended to his ear.

"Tinct. of iodine externally was first employed by Dr. H., but, no result being obtained, he directed him to take a full dose of Epsom salts. This had the desired effect. The enlargement disappeared very quickly, and did not return."

"*Obstruction of both Submaxillary Ducts.*—December 17th, 1847, John C. Lyons, aged 20, Benton Center, Yates county, consulted Dr. H. He stated that in the latter part of July, while harvesting, the weather being very warm, he discovered in the morning a soreness under his tongue upon the left side, and before night he found there was a tumor at this point. It was oblong and only about half an inch in length. His physician, Dr. Wolcott, opened it the following day, and it discharged a glairy matter. Since then it had been opened four times; but, a few days before calling on Dr. H., he discovered that there was a swelling on the opposite side, externally, in the region of the submaxillary gland. When seen by Dr. H. the gland was of the size of a pullet's egg, oblong, not painful or tender. It was increasing in size, but he noticed that it was larger in cold and damp weather. His health was good. He was advised to submit to a low diet, take physic, and apply externally the tinct. of iodine. He was never seen again, and the result is not known. During the winter of 1847 and '48, two similar cases of enlargement of the submaxillary gland were presented in Dr. Hamilton's Surgical Clinic, at the Buffalo Medical College, one of which had resulted in an external salivary fistule.

"In a recent report of one of Professor Jarjavay's clinics, copied into the number of the *Gazette des Hôpitaux* of November 23d, 1867, similar enlargements of the submaxillary gland are mentioned as occurring in connection with obstructions of Wharton's duct; but he restricts the application of the term ranula to obstruction of some one of the twenty-eight or thirty excretory ducts of the sublingual gland."

Ranula.—In one of a series of interesting papers on "Anatomy in its Relations with Medicine and Surgery," Dr. D. Hayes Agnew makes the following remarks on this subject: "A tumor is met with beneath the end of the tongue, rising from the floor of the mouth, to which the name *ranula* has been applied. It involves the ducts of the sublingual glands, the excretory orifices of which here open.

These become obstructed by some substance, either mechanical or inflammatory, the secretion accumulates behind, distending them finally into a semi-transparent tumor. Sometimes they are found to be firm and resisting in the texture. In such cases the distention has provoked an inflammatory exudation and its organization into fibrous tissue. The transparency will depend upon the attenuation of the mucous membrane. The same morbid condition may be present in a very limited degree, confined even to a single duct, so as to resemble a little vesicle. The cure of such can rarely be accomplished by puncture and evacuation of the contents: the wound you make will soon heal, and, as the duct or ducts are not restored to a previous condition, the swelling will be reproduced. No treatment short of that which contemplates the destruction of the glandular tissue will prove effectual. This is best attained either by injection or excision; the latter I think the preferable, which is readily done by including the mass within two elliptical incisions, and then allowing the wound to heal by granulation or stitching the edges together with the finest silver wire. If it be a small cyst, after clipping it away, the point of a stick of caustic may be carried into the wound for a moment or so.

"Another tumor is found in this same locality, and which is produced by a salivary calculus becoming arrested near the outlet of the submaxillary duct; and, last, another variety of tumor, which I am disposed to believe is rare, and being connected with the under surface of the top of the tongue, rather than the floor of the mouth, must be referred to the cluster of glands there situated. The sides of the tongue may be bound down by cicatricial tissue, so as to interfere with its proper functional movements. Should a nerve-filament happen to be included, it may give rise to a very painful condition. This is best remedied by incisions or exsection of the diseased structure."

Lately, at the Imperial Society of Surgeons there was exhibited by M. Paulet two salivary calculi found by him in Wharton's duct. In connection with the presentation was reported the unique fact—for such it was thought to be—that the submaxillary glands of both sides were found stuffed with calculi. M. Pana, however, presented at the same meeting a single calculus taken by excision from this gland. It happens, also, that at the present time I have under treatment a similar case, the first ever met with by me. The stone is situated on the inside of the mouth, just anterior to the ramus of the left side.

Ranula treated by Mechanical Pressure.—"Nearly seven years ago," says Dr. Wm. Macdonald, "J. F——, aged twenty-two years, and residing in M—— Street, in this city, consulted me in consequence of being much distressed with a ranula, or a large tumor under her tongue, arising from an accumulation of saliva and mucus in the ducts of the sublingual gland. For two years after the period this person consulted me, she was attended both by my professional friends and myself, and that without success. During these two years that this patient was under the surgical and medical treatment both of my medical friends and myself, the following methods of cure were adopted in succession: the ranula was very often opened with a lancet, and injections of rose-water and sulphate of zinc (five grains of the sulphate to the ounce of rose-water) injected by means of a syringe, night and morning, into the cavity of the emptied ranula. Occasionally, when the ranula burst of its own accord, and left an ulcer, considerable portions of the sublingual gland were dissected out; and on one occasion the actual cautery was proposed to be employed; but the patient would not consent to the employment of this method of treatment. During the two years the patient was under treatment she took occasionally tonics and alteratives, together with laxatives, as the nature of her case seemed to require, but without any good effect.

"In these critical circumstances it occurred to me, about five years ago, that, if the fluid contained in the ranula were completely evacuated, the employment of pressure over the tumor might cause adhesion of almost all the internal surfaces of the tumor, except a fistulous aperture or apertures, analogous to the sublingual duct, through which the saliva would necessarily flow, and by necessary consequence a radical cure would be produced, provided that a permanent adhesion of both surfaces of the ranula could be effected.

"In order to produce such a result, I proceeded to perform the following operation. (I must remark that the size of the tumor at this period was such as to preclude the possibility of swallowing any fluid or solid kind of food.) I introduced a bent needle, armed with a ligature, into the ranula, with the view of enabling me to render the tumor steady while I was opening it with the lancet, and also in order to direct me afterward in injecting the ranula; this being done, I procured a common musket-ball of lead, a little flattened, and having a perforation through it, and through this perforation in the bullet I introduced a yard or so of common tape, which was loosely tied around the neck of the patient, while the

bullet remained in the patient's mouth and pressed by gravitation upon the upper covering of the ranula. It is obvious that the tape fixed to the bullet served only the purpose of preventing the patient from swallowing the bullet while it remained in her mouth. The bullet thus kept in the patient's mouth night and day for two weeks produced union by inflammation (caused by mechanical pressure) of both surfaces of the ranula, except two fistulous apertures analogous to sublingual ducts, through which saliva has flowed on each side of the frænum of the tongue ever since; and this patient has happily had no return of her troublesome complaint from that period to this date. Now, as nearly five years have elapsed since the cure of the ranula, we may hope that the disease will not again return."

CHAPTER XL.

PALATINE DEFECTS AND THEIR TREATMENT.

In the treatment of any palatine defect, the first consideration is to be of its cause and condition. Thus, it will be found that such defects or deficiencies may, by influencing circumstances, require treatment so modified or changed as to seem, in cases apparently similar, quite at variance with each other.

For example, let us take two perforations exposing the nares; one congenital, the other the result of disease. Now, in the first of these cases we might adopt any operation or appliance which would seem to promise relief; while in the second we might justly pause at any interference. No one in his senses would attempt the operation of staphyloraphy on a patient laboring under acute syphilis, or where a mercurial course had so broken down the crasis of the blood as to make union by the first intention impossible, or even doubtful. No more would he be justified in attempting this or any other of the operations of expediency, with the constitutional conditions adverse to success, than he would be justified in avoiding the responsibility where such influencing associations were favorable.

Cleft Palate.—The condition known as cleft palate, to which we at once pass, may, from its exceeding frequency, be the first to claim attention. A cleft may be partial or complete; that is, there may be a simple lengthwise division in that portion of the mouth known as the soft palate, or the cleft may be so extensive as to extend from the uvula to the lip, a fissure separating both hard and soft parts. The first of these two conditions is found perhaps most frequently as the result of disease; the latter is nearly always congenital. Indeed, I do not recall a single case where I have met complete fissure as the result of disease. I have treated fissures produced by syphilis where there was a break both in the bone and in the soft palate, but never that I remember where a coexistent break existed in the continuity of the lip.

Fissure of the hard palate the result of disease, differs, however, from congenital fissure in a particular which I think would scarcely

allow of the surgeon being deceived. A fissure the result of disease exhibits a break in the continuity of one or both palatine bones; a fissure having congenital origin exhibits, so far as my experience goes, the deficiency at the line of contiguity or in the palatine raphé —this at least as the rule.

Let us first consider the condition and treatment of the congenital cleft. A child is born, toward whose mouth attention is first directed either by the nasal character of its cry, or a little later, by its inability to take the breast properly, or, what is by great odds much the most frequent case, the condition is marked by the break continuing through the lip, giving the deformity known as hare-lip.

When a child is thus, unfortunately, born, and the attention of the surgeon is called to the case, it seems to me but a single question presents itself for his consideration, namely, how the deformity may be corrected: suffered to exist, every day will increase the difficulty of the cure, that is, so far as the most formidable part of the operation is involved, while if at once attempted, the prospect of complete success is very great.

Fissure of the hard palate has generally been deemed irremediable, so far as operative means are concerned, and the surgeon has learned to consider his whole duty done in describing to the parents the mechanical method which in after-life is to conceal and correct the trouble of his patient. Now, in this chapter I shall present a remedial surgery which is as practicable and feasible as any other of the operations of expediency, and perhaps I am justified in going so much further as to say that the modes of procedure will be found much more promising than the majority of such operations. Through the proper application of mechanical allied with the more strictly surgical means, I have not unfrequently succeeded in effecting changes in the young maxillary bones, a simple description of which might cause my veracity to be doubted; and yet this ability to effect such changes must become very plain to us, if for a single moment we pause to consider the difference between the composition of the young and that of the old bone. Young bone, or bone at birth, as is well known, is almost if not quite half made up of animal material; while in the osseous structure of the adult there is an excess in the limy, or unyielding material, of from seventy-five to perhaps quite eighty-five per cent.

Let me refer to the old experiment of the maceration of bone in dilute muriatic acid, to illustrate more familiarly this yielding constituent of bone. We know that if we subject a bone to the action of this acid for one or two weeks, we may tie a rib like a whip-cord.

Now, we do this simply by reducing an old bone to somewhat the condition of a young one. I have removed a rib from a living young cat, and played with it in this same whip-cord manner. I have perceptibly bent the femur of a young child; but no one, I imagine, ever performed such a manipulation on the healthy femur of the adult. You may take an inferior maxillary bone, even in the child of fifteen years, where the projection of the chin is so great as to produce deformity, and with a properly-constructed vertico-mental elastic sling you may, in a period varying from three weeks to as many years, so change the angle of the bone as to do away entirely with the deformity. You may take the projecting myrtiform border, and through the instrumentality of the occipito-alveolar sling you may in quite a short period compel it to a natural articulation. On this known yielding character of the young bone, therefore, operations for the correction of congenital fissures of the hard palate may be founded.

A congenital fissure of the hard palate may be corrected instantly, or the cure may be effected slowly. The first of these procedures is applicable to such cases as present but a limited separation of the bones; the latter, when the fissure has considerable width.

The operative procedure for the immediate cure is as follows: an instrument, a modification of the Hoey clamp, or the ordinary arterial compressor, is to be made by so arranging the pads that they shall apply to the sides of the jaws and allow of the force being so directed that the pads can be approximated without undue facial pressure. The clamp of Hoey, it will be seen, needs alteration only so far as the pads are concerned, and is quite easy of adjustment to this purpose.

The instrument ready (the patient being in proper condition), the operator commences by paring the soft parts and bone on both sides of the fissure, beginning on the approximal faces of the palate-bones, and cutting forward to the alveolar face of the chasm. This part of the operation completed, the little patient may be allowed to rest until the bleeding ceases. The next step is to re-etherize and apply the compressor, the curved pads embracing the buccal faces of the alveolar arch; by now gradually turning the screw of the instrument, the yielding bones are brought together. The next and last step in the operation is to retain the parts in position by the use of compresses placed upon and below the malar bones, and secured by adhesive strips applied as in the occipito labial cravat of Mayo.

It may be urged against these manipulations that they are formidable and too heroic; that fractures may result, etc. On these points the surgeon must decide for himself. I can only answer that, if carefully performed, it is not a dangerous operation; fracture of the bone, even if it should occur, would be of little consequence, as the parts have to be kept, as it were, in splints, and consequently the treatment of the one would be the treatment of the other. The most marked risk would be from inflammation that might be provoked; but a surgeon not unfrequently has to run far greater risk for even a less result.

Another mode of securing the same end, which is entirely divested of formidable risk, is as follows: take a circle of india-rubber tubing, the circumference of which shall be about one-third or one-half that of the child's head; next prepare two firm compresses, of a size adapted to the case under treatment; place these pads or compresses one on either cheek, in such position as will give them their rest on the buccal faces of the alveolar arch. These being secured in place by one or more delicate strips of adhesive plaster, take up the ring of rubber and pass it around the cervico-labial diameter of the head. Passing over the compresses, it will thus exert, as is seen, a gradual pressure, serving to push the bone toward a common center, this center being the mesial line of the palatine arch. This process is a gradual one; but, if the patient is young, I think it will be found to succeed; the only real objection to the manipulation is the constant care necessary to prevent excoriation of the tender skin.

When, by this procedure, the bony parietes have been brought into contact, the operation, so far as the hard palate is concerned, is completed by simply paring the folds of the mucous membrane. It may or may not be necessary to coaptate them; if the bones have been brought very closely together, the granulations will alone be sufficient to bridge the slight remaining chasm.

In either of these operations it is seen that the break, both in the soft palate and lip, is not remedied. It is well, I think, not to attempt the cure of the lip until the patient has entirely recovered from the foregoing operation. It may then be performed, and, if done according to a rule, hereafter suggested, will secure to the patient a lip so perfect that, in adult life, little or perhaps no mark of an operation will exist. The operation for the cleft in the soft palate must be left to a period later in life, for reasons presently to be alluded to.

These suggestions for the cure of cleft in the hard palate were, I

thought, original with myself,—though it is of slight consequence who invents an operation, so that it is good; but in the periscopic department of the *Dental Cosmos* I find the following extract, made by Dr. Ziegler, from the *Australian Medical Record* and *Dublin Medical Press*, which shows that the operation was conceived by another before it presented itself to my mind. The extract is a short one, and so *apropos* to the matter that I shall take the liberty to present it entire:

"*Pressure in the Treatment of Cleft Palate.*—I am not aware," says the author, "that the subject of using pressure in treating fissure of the palate has been before suggested. I am inclined to think that it has not; for when the plan first presented itself to my mind, in 1851, I carefully examined French, German, English, and American works to see whether it had. I was first led to try it on the dead body of a child, which had died three weeks after birth. The fissure was longitudinal, and large enough to admit the extremity of the little finger; fissure of the lip also existed. By means of a pair of clamps, the sides of the fissure were brought readily in contact, without any fracture or displacement of the bones; the only fault was that the gums of the upper jaw were within those of the lower; but nature would modify this as the living child grew up; the use of pressure on the lower jaw would remove a great deal of this deformity; of course the amount of deformity would depend on the size of the fissure in the palate. I several times repeated the experiments on young dogs, removing a piece of the palate-bone by means of Hey's saw, and then applying the pressure. The animals did well.

"The operation should be performed as early as possible after birth, when the bones are in their softest condition. The following is the plan which I would suggest: the edges of the fissure having been pared, the superior maxillary bones should be embraced by a horseshoe-shaped clamp, with a shelf on its lower border to receive the gums and prevent it slipping. It should be padded with india-rubber or some other material to prevent the germs of the teeth being injured. The clamp should work on a joint, and possess arms. It may be said to resemble a large pair of pincers with horseshoe-shaped blades. A screw may be attached at the extremities of the handles, for the purpose of bringing the blades in contact, or the hands may be used: the former would be, I think, preferable, as the force could be applied gradually, and not be likely to be carried too far. It may also be employed in grown-up children, when the bones are so widely

separated as to render it difficult to get soft parts enough to close the opening, but in a gradual manner and at intervals more or less prolonged, according to the amount of pain it excites. If it were used suddenly it might produce inflammation, and subsequently abscess, which would prove troublesome to treat. From the foregoing it will be, I hope, understood that the younger the child the safer the operation is likely to prove, and that even in grown-up children it may be adopted, with precaution, with decided benefit.

"The pads and the ledge to rest the teeth upon should be made to slide in the sides of the clamp: the former, that the pressure may be directed on any part of the bones; the latter, that the edges of the teeth may rest on it, without the pressure being directed either too high or too low, but at the point where the palate-bone joins the superior maxillary."

We pass here to the consideration of the treatment of the fissure in the soft palate. This operation is known as staphyloraphy, a term derived from two Greek words, which signify suture of the uvula. As generally practiced, it is rather difficult of performance, and so frequently unsuccessful that surgeons seem disposed to avoid the responsibility of it. I propose here to suggest for consideration a new mode of performing the operation, which renders the manipulations as easy of accomplishment as by the old mode they are tedious and difficult.

Preparation of the Patient.—For weeks before it is designed to perform this operation, preparations are made for it, by subjecting the parts to such daily manipulations as shall educate to forbearance the natural sensibility of the fauces. Without such preliminary manipulation, the retchings and spasmodic twitchings would be such as to render a proper performance of the operation almost an impossibility. With such education, the parts will be found to assume, in a reasonable time, a stoical indifference to even quite severe irritants. This forbearance is secured by roughly fingering the part daily. I think it is not amiss to occasionally pass the point of the tenaculum through the parts to be operated upon. I never knew the trifling wound to give any trouble; and the double advantage is gained, if the part be put on stretch, of securing an estimate of the capability of the velum to be brought to the mesial line,—an important item in the operation, as will be easily appreciated. Some surgeons are in the habit of daily tickling the parts with a fine brush; this, I should suppose, would answer a very

good purpose. A very admirable idea, and a most successful one, is to have made an obturator,* which shall extend back to the palate border, or nearly to it. This is to be placed in the mouth, and as soon as the irritability it produces is so far overcome as to permit of its permanent retention, the bands attached to it are to be clasped firmly about the necks of the teeth, and it is worn continuously for one or two months. When the parts have thus submitted to the presence of an obturator, they will be found quite ready for any operation.

On the evening before the day of operation let a saline cathartic be given the patient—particularly if he is robust and strong. The meal immediately preceding the performance should, I think, always be a substantial one, for it is to be remembered that the patient is to have little to eat for some time.

In operating on the depressed and anæmic patient, let his deficiency in vital forces be first considered, and, as far as possible, let it be corrected. If such attention is neglected, we will be almost sure to make a failure: the parts will not unite. Exercise in the open air, generous living, and the iron tonics may be prescribed. To sum all up in a single sentence, the preliminary treatment must meet the indications of each particular case. If, for example, you should operate on a scorbutic patient, or a patient disposed to purpura, without correcting such dyscrasis, you would be no more likely to gain union of the parts brought together than in an operation on the cadaver.

The surgical anatomy of the part is required fully to be understood. So much of success depends on a thorough knowledge of the muscular relation to the cleft that such acquaintance would give a success where otherwise a failure would be sure to result. This anatomy we may study before taking up the steps of the operation.

To get a correct idea of the soft palate, we should commence the study of it, by first carefully examining the parts on the living subject. When we look into a living mouth, we see an arch stretching from every portion of the alveolar edge backward and inward, toward the fauces, terminating in a tongue or uvula, pendant in a horizontal direction from its center. One-half of this arch is seen to be fixed, the other—the posterior half—is seen to be in almost constant motion. If, now, the finger is carried into the mouth, the fixed part is found to correspond with the boundaries of the palatine faces of the maxillary and palate bones; that is, for a certain ex-

* A description of this instrument and of its proper use will hereafter be given.

tent, you feel that the parts are solid, as if the finger passed over an arch of bone which might be covered alone by mucous membrane; and this is in fact about the case. The finger traverses the anterior bony border of the mouth, or the hard palate. As now the finger is passed backward, it falls over a hard ridge upon parts that are soft and yielding; this hard ridge is the posterior face of the palate-bone, and terminates the hard palate. The part upon which the finger has fallen is the veil or soft palate, the part that was observed to be movable. This is the part in which occurs the rent, or cleft, for the cure of which is demanded the operation we are about to consider.

The mobility of this part, which pertains to its function, depends, as may be anticipated, on an associated muscular structure. To study properly this structure, which is all-important to be practically understood and appreciated, the student should take up the scalpel and pass to the cadaver; it is, perhaps, only by dissecting that a really satisfactory idea of these muscles can be secured,—that is, as pertains to that kind of knowledge which gives confidence when we come to perform operations upon the part.

The external coat or covering which we see on every mouth, living or dead, is the mucous membrane; simply the continuation of that which covers the hard palate; but while in the case of the hard palate we find all the underlying structure osseous, in the soft palate we discover this deep tissue to be made up exclusively of muscular tissue—at least as far as a surgical anatomy is concerned, or as it alone serves our purpose here to study it.

Commencing with the mesial line, we can dissect out the attachment of five muscles, each of which is of course duplicated on the opposite side, and each of which has such relation to this mesial line that, in case of cleft or split, it serves more or less to draw away the parts postero-laterally.

These muscles, mentioned in the order of their signification to this lateral displacement, and consequently in their relation to the operation of staphyloraphy, are tensor palati, palati glossal, levator palati, palati pharyngeal, motores uvulæ. But of all these muscles the tensor palati plays the most important part, and is therefore entitled to closest consideration.

This muscle arises from the scaphoid fossa at the root of the internal pterygoid plate, from the anterior surface of the Eustachian tube, and from the spinous process of the sphenoid bone. If you carry your finger (in your own mouth) back to the wisdom tooth of

the superior jaw, and let it drop over and back of this tooth, it will fall on the tuberosity of the maxillary bone; carry it now half an inch farther back, and it will come to a second prominence; this is the hamular process of the pterygoid plate of the sphenoid bone. Now, the tensor palati muscle descends from the origin of which we have just informed ourselves, and meeting this hamular process, it winds—as a tendon—around it, and then, by a fanlike expansion, spreads itself over the soft palate. Its action is evident: it expands the palate laterally.

To perform successfully the operation for cleft palate, it is perhaps desirable, in every case, that the strain made by this muscle should be taken off. A moment's reflection will show us that the action of the muscle, in case of a cleft, would, when the parts were brought together, be much increased over its natural capability, not only because it would be put considerably on the stretch, but because such stretch would, more than likely, excite it to a spasmodic contraction. The muscle of course is then to be divided; and we may as well here, as anywhere, consider the easiest point at which such preliminary operation can be done.

We remarked of the muscle that it would be found winding—as a tendon—around the hamular process. It winds from the back, and outwardly, inward, and forward, so that just in front of the process, between it and the tuberosity, is the place at which its section may be best performed; there are here no important vessels to be wounded, if we except the posterior palatine artery and nerve, and they hug the base of the tuberosity so closely that it would, I think, have to be a very badly managed knife that should interfere with either of them. The cut should be a little oblique. The interference with function, as in most cases of myotomy or tenotomy, would be of course but temporary. The action of the muscle would be found recovered quite as soon as our cleft operation would be ready for it.

The next most important muscle is the palato-glossal; this is simply the anterior half arch, the constrictor isthmii faucium. It arises, as will be seen, from the soft palate on either side of the uvula, and, passing outward, is inserted into the sides of the tongue, blending with the fibers of the stylo-glossus muscle.

The palato-pharyngeus arises from the soft palate, by an expanded fasciculus, and, passing outward, goes to be inserted into the posterior borders of the thyroid cartilage. These muscles constitute the posterior half arches. Section, both of the palato-pharyngeus and

the palato-glossal, is to be made through the substance of the muscle, and is accomplished simply by nicking, somewhat deeply, the arches—four cuts, one to each arch. These nicks are best made with scissors.

The Levator Palati.—This muscle arises from the petrous portion of the temporal bone, passes into the interior of the pharynx, and then descends obliquely downward and inward, spreading its fibers out over the posterior surfaces of the soft palate as far as the raphé.

The action of the fifth and last muscle, the azygos uvulæ, it is perhaps not absolutely necessary to consider—its influence, for separation of the wound, being very trifling.

Section of the levator palati is thought to be easiest of performance after the manner suggested by Mr. Pollock. This gentleman first puts the flap on stretch, and then, with a double-edged knife, makes an incision through the soft palate just on the inner side of the hamular process. The handle is now alternately elevated and depressed, a sweeping cut being made along the posterior surface of the soft palate.

The other anatomical elements of the soft palate are glandular structures, vessels, nerves, etc., all associated, more or less intimately, by connective tissues; but these need not be particularly referred to, as one could not well dissect out the muscles without necessarily familiarizing himself with them. Thus, then, we understand the surgical anatomy proper of the parts—the anatomy as it has relation to cleft palate.

The operation of staphyloraphy was first practiced by a dentist of Paris, La Monier,—if I remember the name rightly. It has for its object the bringing together of the separated portions of a cleft soft palate, and the retention of the parts in apposition until nature shall unite them.

The operation consists of four different stages, with an object to be attained by each stage:

1st. The paring off of the edges of the cleft.

2d. The introduction of ligatures.

3d. The bringing together of the freshened edges, and fixing the ligatures.

4th. The relief of any tension on the ligatures that may attend the approximation of the parts.

These are the steps or stages, and to accomplish them various means and instruments have been devised—some good, some bad, some indifferent. The reader curious in such matters will find an

admirable and most instructive chapter on the subject in the System of Surgery, published in 1851, by Professor H. H. Smith, of the University of Pennsylvania. In the chapter therein devoted to staphyloraphy is given a synopsis of the operations as practiced by surgeons whose names have been and are particularly associated with the subject.

An epitome may be made of this chapter by noticing that the operation first suggested by La Monier, in 1764, was revived by Graefe, of Berlin, in 1817, but first methodized and published, with the rules for its performance, by Roux, of Paris, about 1819. In 1820 a nearly similar operation was performed by Dr. John C. Warren, of Boston, he being at that time ignorant of the views or operations of other surgeons. In many respects the steps proposed by Drs. Warren and Roux correspond, though the means suggested by Dr. Warren are simplest—the operation of the latter being, however, generally regarded as the basis of the various modifications that have since perfected the proceeding.

The instruments prepared by Roux for performing the operation are alluded to as being sufficiently complicated. To execute the manipulations, he seated his patient before a strong light, with his head thrown back and supported against the chest of an assistant—the mouth being kept widely open by means of a cork placed between the molar teeth. The surgeon then placed himself in front, and, with forceps held in the left hand, seized the right lip of the fissure. With his right hand armed with a needle-holder, he next introduced the point of the needle from before backward behind the uvula, in order to traverse the flap from behind forward, at three or four lines from the free edge of the fissure. The needle, being thrust in as far as its head, was then freed from the needle-holder, and seized at its point by forceps, which drew it and the ligature through into the mouth. After permitting a few minutes of rest to the patient, the same manœuvre was practiced on the left side of the fissure with the other needle of the same ligature, the two ends of which were thus brought out into the mouth. In passing these ligatures, M. Roux commenced with the lowest, next passed to the highest, and ended with the middle.

The next step in the operation of Roux was to freshen the edges of the fissure. This he accomplished by seizing the margins, as before, with his forceps, and paring from behind forward.

To tie the ligatures, this surgeon commenced by knotting the middle one with the fingers, and, after making a simple knot, confiding

it to an assistant, who held it with an instrument termed by the French a *serre-nœud* (knot tier); he then passed on to the second ligature, and from that to the first, drawing them tighter than is necessary to approximate the edges of the wound, in order to prevent any separation. Eating, drinking, and speaking were interdicted the patient for from two to three days, the ligature being removed on the third or fourth day, excepting the lowest one, which was allowed to remain twenty-four hours longer than the other.

Dr. John C. Warren performed the operation as follows. The patient being well supported and secured, a piece of wood, an inch wide, a little curved at the end, and with a handle to be held by an assistant, was placed on the molar teeth of one side, to keep the mouth open. A sharp-pointed curved bistoury was then thrust through the top of the palate, above the angle of the fissure, and carried down on one edge of the cleft to its extremity, and the same was done on the opposite side, so as to cut out a piece in the form of a letter V, including about a line from each edge. Next a hook, or curved needle, fastened in a handle, with an eye on its extremity, and a movable point, armed with a triple thread of strong silk, was passed doubled into the mouth through the fissure behind the palate, and the latter pierced by it one-third the length of the fissure from the upper angle of the wound, so as to include about three lines of the edge of the soft palate. The eye, with the ligature, being seen, was seized with a common hook and drawn out. The eyed hook was then drawn back, turned behind the palate, and the other edge transfixed in a similar manner. A second and a third stitch was now passed in a similar manner, the third being as near as possible to the lower end of the fissure. Then, seizing the upper ligature with the finger, the knot was tied without using a serre-nœud, and placed on one side of the wound in order to prevent its pressing on the fissure, the other being tied in like manner, and the fissure closed.

After the first operation of Dr. Warren, Dr. A. H. Stevens, of New York, September, 1826—see *North American Medical Journal*, vol. iii. p. 233—operated successfully, by first inserting the ligatures and then paring the edges.

In 1827, Dr. Mettauer, of Virginia, operated for staphyloraphy, and in 1837 published an excellent essay. Dr. M. employed leaden ligatures: see *American Journal of Medical Science*, vol. xxi. p. 309.

Allusions are made in this chapter to other operators and operations; but, as they are all only modifications of the methods of Roux and Warren, it is not necessary to refer to them.

Several years back I remember having in my possession a monograph on the subject of staphyloraphy, from the pen of the late Professor Mütter. I regret that I cannot now lay my hands upon it. Dr. Mütter was much interested in the operation, and his pamphlet, as I recall, abounded in cases illustrating his success in this direction.

To Mr. Fergusson, of England, however, more than to any other man, are we perhaps indebted for a scientific appreciation of the requirements in staphyloraphy. The cutting and sewing parts of the operation are simple mechanical manipulations, which are of consequence only as they tax the ingenuity of the surgeon. The proper surgical understanding of the subject consists, as we are prepared to see, in a just acquaintance with the muscular relations of the parts. These relations we have already studied. To Mr. Fergusson belongs the credit of first making these demonstrations. It is very true that before his time incisions in the soft parts had been advised. Roux, Dieffenbach, Mettauer, Liston, and Warren all practiced them where difficulty was met with in approximating the fissure; but the incision practiced by them, as remarked by Mr Fergusson, seems to have been without reference to the anatomy of the parts, and, as a consequence, rendered success somewhat a matter of accident. The operation of Mr. Fergusson, so far as the paring and bringing of the fissured parts together are concerned, is about the same as that practiced by Dr. Warren. He pares the cleft before inserting his sutures, and his knots are made about as Dr. Warren's.

In looking over the history of staphyloraphy, the reader will be struck with the likeness in complaints, the three principal of which seem to be—the difficulty in tying the ligatures, the great tendency of the ligatures to slough out after they are once nicely secured, and the concealment of the parts during operation, both because of deficiency in light and the accumulation of the viscid muco-saliva which in mouths thus affected is secreted in such abundance.

Now, in the direction of operations in and about the oral cavity I have had that experience and that practice which will, perhaps, justify me in asserting that there is an easier and more philosophical mode of performing the operation of staphyloraphy than has yet been practiced. To sit in front of a patient and operate in the mouth is most unhandy. The operator is in his own light; besides, it is certainly much more difficult to operate sitting than standing—motion is cramped, freedom is interfered with. To operate on the mouth of a patient, when the surgeon is seated in front, makes

necessary an assistant, whose office it is to manage the head. This has a twofold objection. In the first place, the assistant cannot follow in all those little changes which are so necessary to success. He does not see quickly the shiftings and turnings which so assist in the manipulations. Again, one is more naturally ambidextral when the arms are supported than when they are unsupported. In operating by sitting in front of a patient, the surgeon must work at arm's length; he has nothing to steady him—no guard which shall enable him to shield himself against any sudden awkward movement on the part either of the assistant or the patient.

To make a knot in a deep canal, such as the mouth or vagina, is not easy. To fix a ligature by compressing something upon it is very simple. Silk acts as an irritant to human tissue—silver or lead does not; therefore, where it is desirable to retain a ligature for several days or weeks, without irritation, metal is best adapted.

Instruments perfectly suited to an operation simplify it greatly.

Predicating an operation on these self-evident truths, I commend the following as the best and easiest mode of manipulating, believing that where once practiced it will take precedence of all other modes.

The instruments required are those belonging to the ordinary vesico-vaginal case,—the long-handled knife, needles, and needle-carrier, shot-carrier and compressor, tenaculum, cutting forceps, silver or lead wire, the little perforated flat shot of McLean, and mop sticks. Better instruments than these for the operation of staphyloraphy will not, I think, ever be devised. The instruments arranged on a tray in the order in which they are to be used, the patient, having the steps of the operation explained to him,—for much is expected from him,—is seated on a chair having a movable head-rest; it is well if this rest moves in a ball-and-socket joint—at any rate, it must be movable backward and forward. The ordinary dental chair answers the purpose admirably. When the head is placed on this rest the mouth will be found to look directly upward. The surgeon now takes his position back of the patient, standing on a footstool of such height that his breast shall be brought on a level with the head of the patient. If the reader is disposed, he can thus seat a friend, and, taking a position back of him, by leaning over his head he will find that when the mouth is opened he not only has a most perfect view of a thoroughly lighted cavity, but by leaning against him, and passing his arms around the head so as to bring the hands to the mouth, he will recognize that, besides having his own arms so

steadied as to allow of the easiest manipulation, he has the movements of the patient completely under his control.

Now, this relative position of the surgeon to his patient gives him not only the advantages enumerated, but he is out of the way of all expectorative efforts. If saliva and blood should accumulate about the parts at which he is working, he can and will, almost unconsciously, and certainly without effort, so turn the head that, while he does not at all interfere with his own manipulations, he throws the fluid into some more convenient part of the mouth. This, I know, can be done so readily that each step of the operation may be accomplished without the annoyance and delay experienced in using the mop. Certainly, a patient so held cannot make any movement too quickly or too unexpected for the surgeon. True, he might be so obstreperous that the operation could not be accomplished; but he could not make any movement which the knife of the operator could not naturally follow, and, therefore, any accidental harm could not be done.

Patient and surgeon thus in position, the tenaculum is taken up and carried through the very point of the cleft pendulum. The part is then put on stretch, and a paring of about a line taken from the whole of that side, cutting from behind forward. The manipulation is repeated on the opposite side. The first stage completed, tincture of iodine, diluted to about one-tenth its officinal strength with wine or water, is given the patient with which to gargle and wash the mouth. This I find to cleanse the mouth admirably; besides, it is a fine healthy stimulant.

The bleeding arrested and the patient a little recovered, the second step of passing the ligature may be attempted. Take up one of the curved needles, and, threading it with the silver wire, fix it in the needle-carrier. Passing now the instrument into the mouth, thrust the needle through one side of the cleft, about three lines from the margin and about half an inch from the apex of the cleft or hard palate. After passing it to the point at which it is held by the carrier, it is to be caught by the forceps and brought through, the slide of the porte being loosened so as to permit of such withdrawal of the needle from its beaks. This accomplished, the needle is to be replaced in the porte and carried through the opposite side; relieving it from the grasp of the carrier as before, the two ends are brought from the mouth and their relation secured by one or two twists. This completes the first ligature. A second is now passed half an inch farther on, also a third, or more, as may seem needed.

The manipulations required are of course the same as for the first. This completes the second stage, and the patient is allowed to rest as before. If he needs to wash his mouth, the surgeon must look carefully after his ligatures.

The third stage, or approximation of the edges, is next to be accomplished. Take up the shot-carrier, and, slipping through its fenestra the twisted ends of the first ligature introduced, push the carrier down the wires, and you will find, as it approaches the palate, the edges of the cleft approximate. This I think will always be found to be the case with the ligature nearest the hard palate: the parts come together very easily. You now slip off the carrier and take up one of the perforated shot; put this on the wires, and with the carrier force it down to the palate. Holding it now in place, which is done simply by laying the wires against the carrier and shifting your finger over it, take up with the right hand the forceps, and compress the shot tightly upon the wires. The parts up to this ligature will now be found nicely approximated and fixed. This completed, repeat the operation on the second ligature. But this will be found, perhaps, impossible, without greatly overstraining the parts and risking the tearing out of the wire.

If this is the case, you at once desist from the attempt, and make the section as described of the tensor palati muscles on either side. Now most likely the parts will come together comfortably: if so, fix them with the shot as before; if, however, an approximation has not yet been secured, nick the anterior half arch; and if this does not suffice, cut the posterior and the levator palati; the ligature may then be fixed, as well as those still farther back. Each shot firmly compressed, the wires are to be cut off as closely as possible. Thus the third and fourth steps of the operation are completed, and nothing remains but to enjoin on the patient the most perfect rest. Herein lies half the secret of success: the patient should scarcely move for two or three days; certainly he should not be permitted any food that would demand for its comminution the slightest effort of mastication. He should be directed to allow the liquids he may take to trickle down his throat, rather than to attempt to swallow them. These restrictions need not, however, be made quite so strict, if in the operation myotomy of the half arches has been performed.

In the old mode of performing the operation, it was found necessary after the first one or two days to remove the ligatures because of their tendency to slough out: the use of silver wire obviates this

necessity, as the metal seems to provoke no inflammation. These ligatures may therefore, if they seem useful, be allowed to remain from one to three weeks. This non-irritating quality of the metal ligature is so marked that I have seen them, when applied on varicose veins, as firmly fixed after four months as the first day they were put on. This is the feature which adapts them so admirably for staphyloraphy.

The wounds made in dividing the muscles may be left to nature. If the patient is in condition for the principal operations, he is in a condition which does away with any necessity for care in trifling flesh-wounds; if, however, any trouble should arise in such a direction, the practice would be that which would apply to similar wounds, however made.

It is seen that the manipulations here suggested for the cure of cleft palate are precisely the same as those practiced in vesico-vaginal fistula, and that the instruments adapted to the one are exactly suited for the other.

The position in operating is, I think, a new suggestion, and is founded on a somewhat extended experience in manipulating upon and about the mouth. To me it seems the most proper position for performing the operation easily and comfortably; the advantages which it possesses over the old mode of sitting down in front of the patient are so easily studied upon the person of any one, that I trust the suggestion will receive the attention I think it will be found to merit.*

With this consideration of cleft palate proper, we may pass to the study of other defects of the parts.

Holes in the Palate.—Breaks in the continuity of the palate may be treated in two ways: either by an operation strictly surgical, as reference may be had to the use of the knife, or by means which might be denominated surgico-mechanical. If the knife is to be exclusively used, we have simply to pare the edges of the break, and then get the parts in apposition as best we can. Herein consists the difficulty of such operations; and the tact and knowledge of the surgeon will prove his best guides. If the breaks are in the soft palate, any resistance that may be met with is to be overcome precisely as we would overcome it in staphyloraphy: let the surgeon consider what muscle or muscles oppose him, and divide them as before suggested; or, if myotomy seems scarcely necessary, he

* These manipulations were first practiced and described by me in 1861.

can in all probability accomplish his purpose by making lateral slits through the mucous membrane alone, or otherwise he may go a little deeper, making a kind of semi-myotomy.

If the break is small, one ligature will perhaps be all that is necessary to secure the approximation of the pared edges; this suture is to be made and fixed precisely as in the previous operation If more than one suture seems indicated, of course, two, three, or more are to be employed.

Defects in the hard palate are also amenable to surgical skill: they may be remedied by the use of the knife and stimulating local applications, or, if these fail, an artificial palate, properly constructed, will so admirably supply the deficiency that the patient is rendered almost as well off as his fellows.

Using the knife alone, most successful results are frequently attained by first paring the edges of the break and afterward dissecting the parts freely from the bone. This mode of operating is admirably suited to such hard palates as have a thick, soft, mucous membrane. By such a mode of operating, and with such a mucous membrane, quite wide chasms may be easily spanned.

With mucous membrane of this character, plastic operations will be found to answer very well. It is quite easy to get a flap without disturbing the periosteum, and such a flap may be twisted on its pedicel without any special interference with its function. The pedicel, however, should be as wide as possible, remembering that the circulation pertains to the basement membrane alone. An objection, however, to such operations in the mouth is the difficulty that attends the fixing of the flap in its new place.

The next mode of relieving these defects that may be alluded to is that originally suggested by Dieffenbach. This surgeon commends the penciling of the edges of the break with tincture of cantharides, hoping thereby to excite granulation to an extent that shall fill up the cleft.

Now, while this does very well for small holes, it seldom succeeds with the larger. The granulations, having nothing to support them, break down before connecting in the middle.

This defect in the treatment can be remedied, and success almost warranted, by the following modification: make a simple obturator or artificial palate; the mode of doing which is described in the following chapter. After fitting this so as to cover accurately every portion of the hard palate, it may be removed, and the cleft pared; next touch the parts with cantharides or tincture of iodine—the latter

I prefer. The plate is now to be replaced, and will be found to act most completely as a support to the granulations which will be formed. The process of freshening the edges is, of course, to be frequently repeated; but after the first paring the cuts may be made from the circle on, and not around, the cavity.

The next class of palatine defects which claim our attention are such as require for their relief a surgico-mechanical treatment. This brings us to the subject of the Obturator,—an instrument whose style, form, and manufacture are of the same interest to the surgeon as are those of the Pessary to the obstetrician.

CHAPTER XLI.

OBTURATORS.

The instrument, or plate, called an obturator, gets its name from the Latin verb *obturo*, and signifies a something that shall close or stop up an entrance or break. Thus, after the operation of trephining, it is not uncommon to shield the exposed brain against risk of accident by fitting a silver plate over the site of the removed bone: and this shield is, to all intents and purposes, an obturator; it closes the break in the continuity.

In the treatment of palatine defects, obturators may be employed with the greatest success; the range of their application is really wonderful. I have seen one case, at least, where the whole side of a face has been so completely restored through such instrumentality, that a passing observer would scarcely, I think, have remarked anything amiss with the wearer.

In the consideration of the more strictly surgical treatment of palatine defects, we studied the operations which suggested themselves as being the most effective and promising. It is not, however, as we will find, every patient who is willing to submit to an operation; and it is not, on the other hand, as we are prepared to understand, every case that is fit to be operated upon. To leave either class of persons to their fate would be as cruel as it would be unnecessary; it is here, therefore, we may so happily resort to the means known as the surgico-mechanical.

As obturators are to fulfill various indications, so, of course, do they vary in form, style, and method of manufacture. The simplest obturator is one made to cover a break, more or less extensive, in the hard palate proper,—that is, a break which does not implicate either the alveolar borders or the soft palate. Such an obturator holds the same relative position to obturators in general that the Physick-Dessault apparatus holds to all apparatus for thigh-fractures. Both may be termed principals, and all variations are but modifications of these principals. Thus, if we appeciate the style, indications met, and mode of manufacture of a simple obturator, we

understand fully the genius of the instrument, and are thus enabled so to appreciate the mechanism of the piece that we will be prepared to diminish or enlarge its capacity *pro re nata.*

A patient presents himself to us suffering under a deficiency in the hard palate. We examine the case, and find the walls of the break so heavily and solidly indurated that we perceive at once that any attempt to pare and bring the parts together would be futile. Palatoplasty at once, and naturally, suggests itself, but observation of the surrounding parts convinces us that the risks are too great for the good promised. Such is a case that not unfrequently offers itself to the surgeon's judgment. Dieffenbach, whose name is so honorably associated with oral surgery, evidently found himself much embarrassed with just such cases—cases which I would here present as the easiest of remedy by use of the obturator. It was Dieffenbach, it will be remembered, who suggested the stud of india-rubber. Two pieces of rubber the thickness of pasteboard were cut three or four times larger than the opening to be closed, and between these was placed a small round piece; the whole was then securely fastened together by means of waxed thread; one of these pieces was intended to rest on the posterior and the other on the anterior surface of the opening; the small middle piece was for the intermediate space.

A moment's reflection will exhibit the inconveniences as well as the more striking faults of such an appliance. The rubber, unless it was vulcanized (and to be so applied, it could not be vulcanized), would soon become very offensive. It would act as a continual source of irritation, and particularly so far as the posterior base of the cleft is concerned. The center piece, which, to hold the parts with any degree of steadiness, would have to fit the opening with some degree of accuracy, would, because of the presence of moisture and heat, soon expand, thus enlarging the canal. It would be very inconvenient to remove for the purpose of cleansing, which cleansing it would certainly demand daily.

A case amply illustrative of the inefficiency of this mode of treating palatine defects, and, indeed, of the absolute harm resulting from it, is recorded by Dr. J. H. McQuillen, in the *Dental Cosmos.* The patient, who had an opening in the palate, the result of syphilis, was treated by Dr. Neall, who employed, in the first instance, india-rubber as a substance from which to construct an obturator. This was cut somewhat in a button shape, being large above and below, and contracted in the center, thus constituting an apparatus which was retained in position by resting on the floor of the nares, sur-

rounding the orifice. After it had been worn a week or two, the patient returned, when it was found quite loose and the orifice somewhat enlarged, the rubber having acted as a source of irritation and induced absorption. Another apparatus was formed from the same material, and, after being worn a week or so, the orifice was found much larger than at the previous meeting. The rubber was also found considerably affected by the fluids of the mouth. Satisfied that it would not answer the purpose intended, this material was abandoned, and a simple obturator of silver was constructed, covering the orifice and roof of the mouth. This was found to fulfill every indication.

There is another, a somewhat domestic treatment for these defects, which I may here allude to. This consists in stuffing the break with cotton or wool. The cotton not unfrequently escapes into the throat, or, passing into the nares, it has sometimes produced ozæna by lodging among the turbinated bones: quite extensive necrosis of these bones has also been provoked in this way. The practice is not without its danger.

A case of a different class, yet belonging to the same category so far as treatment is concerned, invites, in connection with the consideration of simple obturators, a moment's attention. This is the existence of a cleft or break associated with subacute or chronic disease—the cases to which we allude as not being fit for operation.

Some time since, Mr. ——, a French teacher of this city, had necrosis of the palatine arch, the result of venereal disease; the sequestrum that came away was quite large, producing a break in the continuity of the hard palate at least an inch in diameter, of course freely exposing the nares. The result was, as might be anticipated, that his vocation as a teacher had at once to be relinquished.

I saw this case, in consultation with the attending surgeon, about a month after the patient had resigned a situation which he held in one of our principal private schools, and upon which, up to this time, he had mainly depended for his income. The necessities of the man were, of course, immediate, and any operation for the restoration of his speech was out of the question. I had the happiness of relieving him of his trouble so perfectly after three days, by the use of an obturator, that every time he has since met me he has laughingly assured me that he speaks much better English than before his accident. It is certainly true that he speaks quite as well.

The obturator for these cases consists simply of a metal plate

that shall fit accurately every part of the hard palate, the regularity of the arch to be restored by carrying the plate over the cleft or break. Such a plate should fit with the greatest nicety, and is to be held in place either by bands placed around certain of the teeth, or otherwise by means of atmospheric pressure. The first plan of fastening the piece should be employed when disease is associated with the cleft. The latter is well adapted when the break is not too large, and where all disease has long passed away. To make such an obturator, first take an ordinary impression cup, such as is employed in taking casts of the mouth. This cup is filled with ordinary beeswax, softened before the fire to the consistency of dough. Thus prepared, the operator takes his position behind the patient, as recommended in the operation of staphyloraphy. The cup is now to be introduced carefully into the mouth, and carried just so far back as will allow of the teeth being included within the arch or rim of the cup. This accomplished, cup and wax, in a body, are to be pressed firmly up into the roof of the mouth and around the neck of the teeth and alveolar border. The patient holding the mouth very wide open, the mass is to be removed even more carefully than it was inserted. This manipulation, if properly executed, gives us the exact impression of the mouth. The next step is to make a model. To do this, we take the impression we have just obtained, and, surrounding it with a rim of paper, the rim to be, say, one and a half inches in height, we stir into water the common calcined plaster—sulphate of lime—until we have a very thick, creamy paste. This paste is poured into the impression, and should be enough to fill from the wax, which lies at the bottom, up to the top of the rim. The model thus made is not to be disturbed for three or four hours; it must have time to set.

The next step in the operation is to remove, from about the plaster cast we have just made, the paper and wax. This is accomplished, first, by heating gently the cup in which the wax lies, which permits of its easy removal; and next carefully trimming from about the necks of the teeth, by means of a knife-blade kept constantly warm, the wax which so closely surrounds and imbeds them; in this way the wax may all be safely taken away. The paper is, of course, simply to be torn away, and this is done before removing either cup or wax. Comparing the face of the model thus made with the mouth from which the impression was taken, we shall find we have its counterpart to the minutest particular.

As the model contains the break in the arch, and it is our inten-

tion to restore this arch to its original and natural contour, so is it at this step in the procedure that we can best secure our object. This, I think, is most easily done by taking a little ball of warm wax, and filling with it the hole or break in the model. The natural concavity of the arch is in this way restored. Of course this is not at all difficult, nor is there any guess-work about it, as we have the inclinations of all the surrounding parts to guide us, and all we have to do is simply to model this wax to the proper curve.

The cast is finished by beveling the portion which rested against the paper; this beveling to be so done that the greatest diameter of the model shall be its base.

This completes the model to which the obturator is to be made.

The next step is the preparation of dies. These are to be made, one of zinc, the other of lead; and the process of getting up such casts is precisely the same as that adopted by the dentist or the moulder.

Procure a circle of tin: a common tin cup, with the bottom broken out, answers the purpose well enough. Lay the model you have prepared upon the table, the palate face looking up. Now place the circle of tin over it, and with some moulder's sand, very fine, which you have previously moistened and tempered, cover in the model, packing and filling the circle completely. Now turn the circle or cup so that the base of the cast looks up. Next a penknife-blade or small gimlet is to be inserted into the plaster, and by striking it several light taps the cast will be loosened. It is now to be lifted from the sand by means of the knife-blade. Thus we have a mould for a metal casting. The next step is the making of such a cast. To do this we have only to melt one or two pounds of common zinc, in any convenient vessel, and pour it slowly into the mould. This done, let the whole remain undisturbed until completely cold.

Thus, it is seen, we have prepared, with little or no labor, a correct model of the mouth in metal. It is to this zinc model we are to fit and adapt our obturator. Now, this latter process is easy or difficult, according as one goes about it. One method is to take hammer, files, and pliers, and cut, file, and mallet, until the adaptation is secured. Such a task is almost as hard as was the cleaning of the Augean stables; besides, it is next to an impossibility to accomplish it properly. A second plan, and one which is as easy, simple, and interesting as the other is difficult, perplexing, and annoying, consists in making a counter model in lead, between

which and the model, or male cast, the plate or obturator is to be struck up. This counter model is very easily made, as follows:

Take the zinc cast and lay it upon the table, with the face or palatine surface looking up; lay over it the cup or circle, precisely as in the case of the plaster model. Now, with the sand moistened as before, fill up the cup covering in the cast—packing the sand as solid as possible. Next, without disturbing the cup as it rests upon the table, take a knife and dig away the sand until you expose the face of the cast. You are now prepared to make the counter model. Take a vessel, not the one in which you melted the zinc, and place in it two or more pounds of lead; when melted, pour this over the face of the zinc cast, filling up to the very top the hole which you have dug out in the sand. When the lead has become cool, take the castings from the sand, and, with a hammer, the two can be easily knocked apart.

To make the obturator, by means of these dies, we next proceed as follows: a piece of thin sheet-lead is forced with the fingers over the face of the zinc cast; with a sharp and delicate-bladed knife this lead is cut so as to cover accurately the hard palate, being even festooned so as to adapt itself accurately about the necks of all the teeth. This palate of lead being thus nicely and correctly fitted to the parts, it is taken off the casts and carefully spread out. Next it is laid on a piece of gold or silver plate, and the outlines distinctly marked with cutting forceps; the shape of the arch, as marked from the lead, is then cut out from this second piece of metal. The next step is the process of annealing, or softening the metal, so that it shall be as malleable as possible. This consists in subjecting it to a red heat, which may be done in any convenient manner. The dentist lays the piece on charcoal, and throws over it, by means of a blow-pipe, the flame from his alcohol soldering-lamp. This does it very nicely.

It is next to be taken up, and bent with the pliers so as to fit the cast tolerably; it is not, however, at all necessary, in this procedure, to give one's self much trouble. Next take up the counter model, and lay it carefully over the zinc—the plate being between the two. With the hammer the casts are now to be driven together. In this step of the operation it is rather desirable that we should feel our way,—that is, hit the models a few slight taps, and then, taking them apart, see if the plate is going as we want it. If all is right, the casts may be driven into each other with all reasonable force. If, on the contrary, the plate is not taking

a proper direction, it must be so inclined by means of the pliers. To complete the finish of the plate itself, it may, perhaps, require that the festoons, which are to embrace the necks of the teeth, be cleanly cut out by means of the ordinary round file.

Thus we have our obturator completed. If we place it in the mouth, we will see that we have restored the arch, by our contrivance, to its original condition, at least so far as the purposes of speech and mastication are concerned.

Nothing now remains but to secure the piece firmly to its place. And this brings us to the consideration of modifications of the instrument.

If a patient, for whom we had made such an obturator as that the manufacture of which I have just described, had certain good sound teeth, we might proceed to fix the piece in the mouth as follows: going back to the plaster model, we would fit around such teeth as might seem to us best, delicate bands of metal—gold should always be preferred; these bands should fit the teeth with great accuracy, and are to be fixed to their places while the obturator is lying on the model. Take next a particle of wax, and stick the plate and bands together. Now carefully lift all from the model, and set in plaster. This last manipulation is accomplished by laying the piece on charcoal, and pouring over all, the wax alone excepted, the creamy plaster, before alluded to. When this plaster sets, the wax is taken away, and there is exposed a small portion, both of obturator and bands. These parts are to be soldered together.

This last process fits the piece for the mouth. In placing it in position, we have only to slip the bands over the teeth, and we will find that it is held with all security.

Another plan of securing the apparatus to the mouth is by means of atmospheric pressure. To accomplish this, a cavity is to be made in the piece. This is done by placing on the plaster model, before making the castings from it, a piece of wax; its shape may represent, in diameter and thickness, the ordinary half dime. Or perhaps we cannot find a surface on the arch for a suction of such size and shape; if so, it may be lessened, or the shape may be modified so as to suit any case. What we want is a cavity in the plate; the size and location are not of so much consequence. Such a piece of wax will, of course, be represented by zinc in the casting, and by a depression in the counter cast. In forcing the plate between the dies, the portion represented by the wax is thrown up; thus, when

the plate is in the mouth, a cavity is formed. The obturator is held, in this case, by making an air-pump, as it were, of the tongue, and sucking the air from the cavity. I have seen obturators, thus dependent on atmospheric pressure for fixedness, held so tightly that it required quite an amount of force for their removal. The principle is the same as that employed for holding artificial teeth in place. The whole modus operandi will be perfectly understood at a glance by looking at any set of teeth made for the superior jaw.

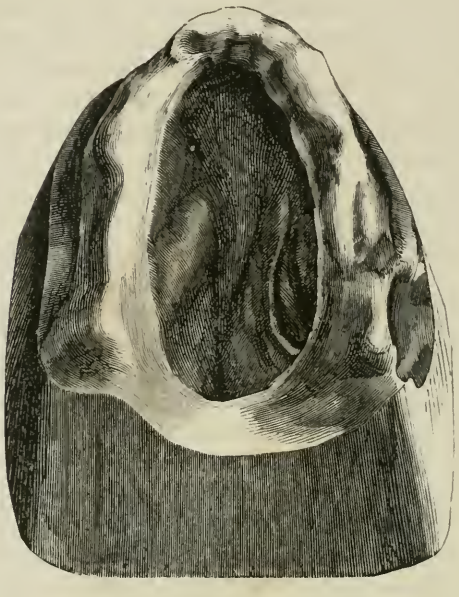
Another modification of the obturator is that in which the piece is held to its place by a bulb or rim, which passes into the cavity of the break. This adapts the instrument to such cases as have neither teeth nor site for suction, where, for instance, disease has destroyed the whole of the hard palate, leaving alone, as boundaries of the cleft, the alveolar processes and soft palate. Such an obturator, and the character of cleft for which it is adapted, are happily and truthfully exhibited in the accompanying drawings. Fig. 105 represents the mouth, Fig. 106 the obturator. This case, together with others which represent various modifications of the apparatus, are from life, having occurred in the practice of prominent dentists of this city. The models, with an accompanying history of the cases, were presented to the Pennsylvania Association of Dentists, at a meeting held by that Society, October 9th, 1860.*

"The first case, as seen in Fig. 105, from the practice of Dr. McGrath & Son, was that of a female over fifty years of age. In this instance the fissure was confined to the hard palate, and was undoubtedly the result of syphilis. Of the history of this case, all that could be obtained was such as was derived from answers to indirect questions which were put to her. They learned that the defect was the result of a disease which commenced as sore-throat and continued its ravages for over three years before it was arrested; this, together with the appearance of the pharynx and uvula,—they being covered with cicatrices, the result of old ulcers,—left them without any doubt as to the true nature of the complaint. The parts which had been destroyed during the progress of the disease were the palate-bones and the palatine processes of the superior maxillaries (making an opening into the nose nearly two inches in length and one inch in breadth), the turbinated bones (with the exception of the middle one on the left side, which is represented in the cut as projecting from the side of the cavity) and the vomer, producing an enormous irregu-

* Report by Geo. T. Barker, D.D.S.

larly shaped cavity, extending as high up as the nasal bones, which latter, however, bore no traces of ever having been affected by the

Fig. 105.

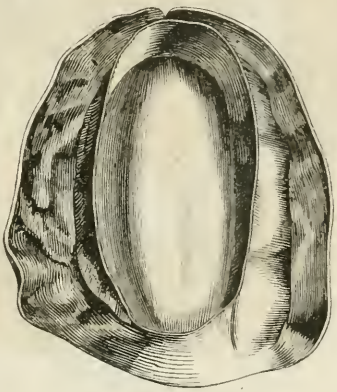


disease. The patient, in order to prevent the passage of the food into the cavity during mastication, had been in the habit of filling the opening with a fold of muslin, which answered the purpose to a certain extent; the velum was entire; the patient had also lost all the teeth of the upper jaw.

"The kind of obturator employed in this case was simple and uncomplicated in its mechanism, Fig. 106. A plate was made to fit accurately to the alveolar ridge, extending about one-eighth of an inch beyond the posterior margin of the opening; also passing in to a distance of nearly an inch, and fitting as closely as possible to the anterior and lateral sides of the cavity. The object of this latter arrangement was to render the plate firm in its position. From the posterior margin of the opening, and extending forward about half the length of the alveolar ridge, was a fold of mucous membrane projecting inward and upward, over this fold; that portion of the plate which was opposite to it was bent. This, together with the suction obtained by the plate fitting closely to the alveolar ridge,

enabled the wearer to keep it in its place. The opening was then covered, by soldering to this a second piece of plate, so fashioned as to represent as nearly as possible the form of the lost palate. The object in not extending the plate into the cavity on the posterior edge of the opening was to prevent a lodgment for the nasal secretions, which by their accumulation would prove offensive to the patient. The artificial teeth were then fastened in their proper position, and the apparatus was complete. This obturator the patient has been wearing for about three months; it remains in place

FIG. 106.

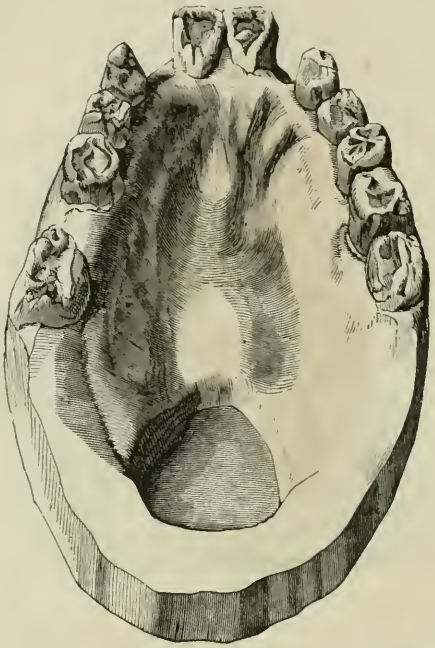


and fulfills the office of mastication as well as any ordinary suction plate in a mouth where no defect of the palate exists.

"The second case, Fig. 107, was also that of a female, but the fissure was confined to the soft palate. This, as in the former case, was the result of syphilis. The fissure extended from the posterior opening of the nares through the velum to the palate-bones, and was nearly an inch in breadth. The uvula was entirely gone, as well as the lateral half arches, and along with them the palato-pharyngei and constrictors isthmi faucium muscles. In this case deglutition was impaired to a great extent; the food would pass into the nares, and the fluids would also pass into the nasal cavity and out through their anterior openings. The disease had not confined itself to the palate, but, extending to the nasal organs, had completely destroyed their internal structure, as well as a portion of the nasal bone, to such an extent as to materially change the external shape of that organ. The obturator, Fig. 108, constructed for this case, was of

one piece, and made to cover the hard palate completely, extending from the central incisors to the posterior wall of the pharynx, and

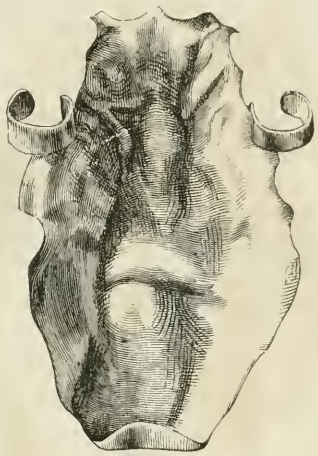
Fig. 107.



passing a short distance beyond the edges of the opening on each side. The plate was made to press firmly against that portion of the soft palate which remained, yet not so firm as to be the cause of irritation, the edges of the plate being slightly bent downward for the same reason; the object being to prevent the possibility of the soft parts being drawn above the palate, which would afford a communication with the nares. The posterior edge of the obturator was bent downward at a right angle with the body of the palate, and curved so as to form with the posterior wall of the pharynx an oval opening sufficiently large to permit the patient to breathe freely through the nostrils. In the act of deglutition, the muscles would contract and press against this portion of the plate, thereby cutting off the communication with the nares. To this plate were attached three artificial teeth,—two lateral incisors and one molar,—the whole being retained in position by means of clasps around the teeth.

"This obturator the patient has been wearing a little over two months, and, like the former one, has proved successful, deglutition being restored, and the speech considerably improved."

Fig. 108.



Dr. T. L. Buckingham, Professor of Chemistry in the Pennsylvania College of Dental Surgery, presented the following cases:

"The first case," he said, "he had anything to do with was that of a gentleman who had an opening through the hard palate, in the center of the arch, about as large as a ten-cent piece. This gentleman had worn an obturator with a sponge attached to it, made in the following manner: a plate was struck up to fit the roof of the mouth, and a piece of sponge was sewed upon the palatine surface to fill the opening, and to hold the plate in its place. Some of the objections to this obturator were that the opening became enlarged from the absorption occasioned by the pressure of the sponge upon the sides of the cavity; it would also become very offensive, and require frequent removal. In this case a plate was struck up to fit the mouth, and attached to the teeth by means of clasps. This simple appliance answered better than any other that had been made for him.

"The second case was a gentleman who had an opening into the left antrum, at the point where the second bicuspid and the first molar had been, but on the outer surface of the alveolar ridge, or rather where

the ridge had been—for the alveolus was entirely absorbed opposite the opening, which was about half an inch in length by a quarter in width. The nasal bones were diseased, which caused an almost intolerable odor.

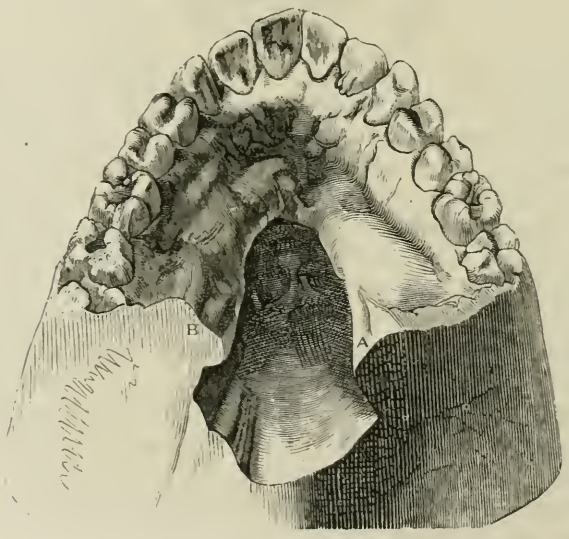
"He made for this case a small obturator to close the opening. This was left open at the top to allow him to place in it a small portion of chloride of lime. His intention was to correct, if possible, the offensive smell, but the patient did not live long enough to give it a fair trial; he remarked that while any of the chloride of lime remained in the obturator there was no unpleasant smell; but, unfortunately for the experiment, the gentleman had lost nearly all the sense of smell, and therefore could not tell when it had evaporated.

"He made for this case an upper set of teeth, to which the obturator was secured, it being held in position, to a great degree, by the plate and teeth.

"In the two preceding cases the voice was not altered when the appliances were in the mouth.

"The third case was that of a gentleman who, on a previous occa-

Fig. 109.



sion, had a tumor removed which covered a portion of the posterior surface of the hard and the anterior surface of the soft palate. The surgeon, on its removal, had divided the velum and uvula, so that the

case resembled a congenital deformity. The attempt had been made twice to bring the soft parts together again by a surgical operation, which had failed.

"Fig. 109 shows the appearance of the parts very clearly—the letters A and B showing the thickened muscles as they hung down on the side of the pharynx.

"He made for this case an obturator, Fig. 110, the plate of which

Fig. 110.

covered the whole of the roof of the mouth, with a bulb attached, to extend up into the posterior nares and well back toward the antero-posterior walls of the pharynx, leaving but a small space between them. This obturator enabled the patient to eat and drink without annoyance; without it food would pass into the nares and occasion much inconvenience. It also greatly assisted his voice, as many of his words could not be understood when it was not worn, but he could articulate them with great distinctness when it was in place; remarked that he had been more successful in restoring the voice in this case than in any other he had treated, and attributed it to the fact that this person, having once had his voice perfect, was always endeavoring to speak as he had formerly done, while in the congenital cases they did not try to overcome this difficulty.

"The fourth case was that of a lady who had an opening in the anterior part of the hard palate, a little larger than a ten-cent piece, and also a small one exposing the left antrum. All the teeth in the superior arch had been removed, and absorption of the alveolar process, opposite the smaller opening, had progressed to such an extent as to present at that point a deep depression; the remaining part of the alveolar ridge had not been absorbed more than is usual where the teeth have been lost.

"Fig. 111 shows the appearance of the different parts—C representing the smaller opening, and D the larger one; between these two points was the depression referred to.

"This lady had never worn any mechanical appliance, but had been in the habit of closing the larger opening with loose cotton or pieces of linen. Without having it filled, she could scarcely be understood when speaking. He made for this case, first, a plain plate to extend over both the openings, but not into them; upon this plate, at the point where the process had been absorbed, he arranged wax so as to restore the alveolar ridge to its natural fullness. By using the plate with the wax attached for a mould, he was able to obtain metallic dies. A second plate was then made to fit over that part of the first one which was covered by the wax; these two plates were then soldered together. The object in forming a double plate was to fill up that part where absorption had taken place, so that the

FIG. 111.

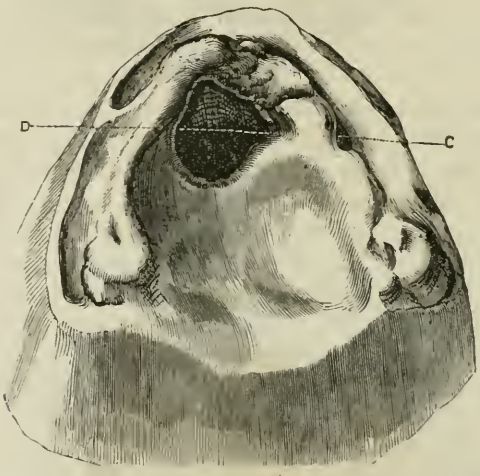


plate when worn would resemble the roof of the mouth, and not be deeper on one side than on the other.

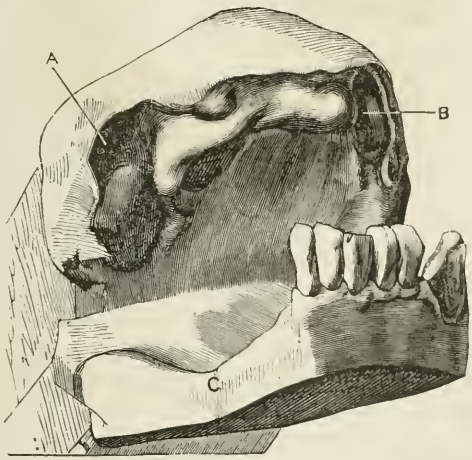
"This obturator was very successful, the voice was much improved, and she could eat and drink as well as persons ordinarily can who wear upper sets of teeth; and, what was more remarkable, she could wear it without springs or any assistance whatever to retain it in position.

"He stated that he hardly knew whether his fifth case should come under discussion at the present time or not, as it could hardly be termed a palatine fissure; but, from its exceeding interest, he would now present it.

"A gentleman was handling a gun loaded with buckshot, when it was discharged in his hands. The gun being pointed toward his head at the time, the load struck him at the angle made by the ramus and the body of the inferior maxillary on the right side, passing upward and outward on the opposite side of the face. It must have been a terrible wound, and should, from the representation given, have caused almost instant death. He, however, recovered, after being confined to his bed for more than a year, and during that time he had to be fed with a spoon. The only way he could eat or drink was to lie on his back and let the food run down his throat, and it was a long time before he found he could swallow.

"The teeth in the upper jaw were all gone excepting the left second molar and wisdom tooth; both antra were fully exposed, the remaining roof of the mouth being left almost flat. The lower jaw-bone was gone on the right side, from the second bicuspid back, and also the condyloid process; but about three-quarters of an inch of the coronoid remained, which was drawn in so as to partially cover the roof of the mouth. The molar teeth were lost on the left side, and also all on the right side from the symphysis. In taking hold of the lower jaw it could be moved either backward, forward, or laterally, to a considerable distance.

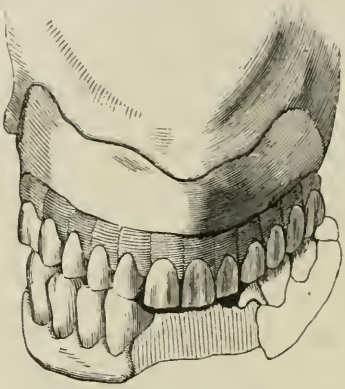
Fig. 112.



"Figs. 112 and 113 show this case—the letters A and B the openings in the antrum, and C the end of the lower jaw-bone. The dis-

tance between the points A and C, when the mouth was closed, was just two inches.

Fig. 113.



"This gentleman had been wearing a partial set of upper teeth which had been attached to the molars, but the clasps of the artificial teeth had loosened them, and it was therefore necessary to replace this piece of work with a set that could be supported in some other way.

"This was the most difficult case he had ever treated. One of the greatest obstacles he encountered was the obtaining of a correct impression. To accomplish this, he first filled the antra with loose cotton to prevent the wax from passing into them; he then took as good a wax impression as he could of both the upper and lower jaws; from these he made impression cups to be used in taking the plaster impressions. There was very little difficulty in obtaining an impression of the upper jaw with plaster (the antra being filled with cotton as before), but it was far more difficult to take a good one of the lower jaw. The distance from the points of the teeth down to the point marked C, as shown in Fig. 112, was so great that when any material was pressed down to take the impression, it was almost impossible to remove it from the mouth without altering it so much as to render it of no value; after several trials he succeeded in getting a very good one with plaster. It had to be broken before its removal from the mouth; but, by carefully putting the pieces together, a good plaster cast was obtained.

"He then made a plate to extend over the roof of the mouth and cover both of the cavities opening into the antra; on this plate he

arranged wax, bringing it down as far as the alveolar ridge should have been; then made a metal cast and struck another plate to fit over the first, soldered them together, and placed upon these single gum teeth as he would have done had there been no more absorption than is usually found in upper cases.

"There was nothing peculiar in the formation of the lower case, except that the teeth had to be very long on the right side (for this a block was made), and the plate was not allowed to extend farther back than to the position once occupied by the second bicuspid tooth. The under teeth were put in more for the purpose of attaching springs for the support of the upper ones than for use.

"He could not say what success had attended this case, as the gentleman left the city immediately upon their insertion, and he had not seen him since that time."

Other cases of equal interest are found in the report; but, as they are unaccompanied by models, I omit them.

A material for obturators is fast winning its way to professional favor in the article known as Vulcanite. This is the base now so extensively used in the manufacture of sets of teeth. Its merits and demerits are widely discussed in all the dental publications of the day, and from these journals everything pertaining to it may be gleaned. The advantages claimed for it are: its cheapness, its lightness, its capability of being moulded into the most irregular positions, and its similation in color and feel to the natural parts. The objections are its liability to decompose and become offensive. The manipulation of the material is so easy that the surgeon attempting the manufacture from it of surgical appliances, would give himself a source of recreation rather than work. To make an obturator from vulcanite, you take an impression of the mouth in wax and make from it a plaster model precisely as before described. Prepared gutta-percha is now moulded over this model to the form required. Plaster is next run over this first model, the gutta-percha plate being between. The model and counter model thus made are separated, and the place of the original plate supplied with fresh vulcanite. The models are now put together, and the vulcanite between subjected to pressure. The whole is then placed in an apparatus termed the vulcanizer, and this being filled with water the temperature is raised to about 325 degrees. When taken from the steam-bath the plate is found to be as hard as bone. The last process consists in the polishing of the piece; this is a simple manipulation, and requires only one or two files, a burnisher, and some patience.

M. Desirabode, a French surgeon, proposes a palatine obturator for congenital fissure of the palate (see Harris's Dictionary), by which he thinks the sides of the alveolar border may be so approximated as to favor a union of the divided parts. It consists of a platina plate fitted to the vault of the palate and fastened to the teeth by means of three clasps soldered to each side, so as to cap the canine teeth, the bicuspid, and two of the molar teeth, bent upon the alveolar border in such a manner as to maintain the whole pressure. After the plate with these appendages has been well adapted, it is to be divided from before backward along the median line, and then a piece removed from either side so that the two edges may be separated about half an inch from each other. The two plates are now united by means of a thick and resisting band of caoutchouc, made fast by riveting. The plates thus united form a smaller obturator than the plate before it was divided, so that it can only be applied by putting the caoutchouc on the stretch, which is effected by means of two sticks so contrived as to force the two plates asunder. After the plate is properly adjusted, these are removed, when, by the contraction of the caoutchouc, the sides of the alveolar borders are gradually approximated.

This contrivance of Desirabode looks very plausible, but, unfortunately, all experience is against its employment.

In the first place, to correct by pressure a fissure in the hard palate, implies the very earliest use of such force. A child is some five or six years old before its first dentition is properly completed; and even at this period one would not dare to apply any such apparatus, because of the physiological process of absorption which has already commenced in certain of the teeth. Then if, on the contrary, he meant his instrument to apply to a more advanced period, he would have to wait until at least the sixteenth year, as before this age the fangs of the molars are not perfected. The bones by this time have, as a matter of course, become much less amenable to treatment. And, again, even besides this, as I know from practical teachings, his apparatus would in less than a week's time produce such periosteal trouble about the alveoli that no human being would, or could, bear the continuance of the pressure; or, even admitting there should be found a patient heroic enough to bear the treatment, the apparatus would have its usefulness destroyed in less than two weeks by the teeth, to which it was attached, coming away. In other words, the instrument is useless, because the teeth, being the weaker and more yielding, would give way first.

In Liston and Mütter's Surgery is an engraving of an obturator made to supply the loss of both hard and soft palates. The contrivance, which is a simple plate such as I have described, is seen to extend from the teeth back to the fauces. Attached to the back portion of the plate representing the soft palate, is a metal pendulum working on a hinge—this pendulum is much better omitted, for, while it cannot possibly answer any useful purpose, it must certainly be much in the way. In making so extensive an obturator, it must not be forgotten that the part which represents the soft palate is to be given the double curve which is seen on looking into any healthy mouth. To get the impression for such an obturator we have only to employ a deeper impression cup.

Dr. E. Wildman, of the Pennsylvania College of Dental Surgery, kindly furnishes me with a description and cuts of a case, which, as a study, could scarcely occupy too much attention. The patient I have myself seen.

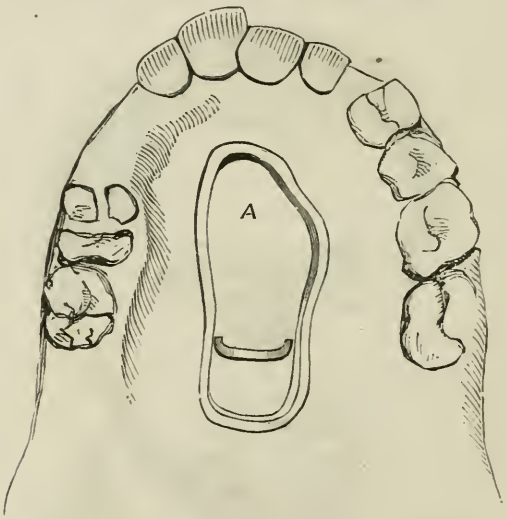
Fig. 114.—The Face without Nose.

Fig. 114 will convey an idea of the external appearance of the patient, but not fully, as the whole upper lip was cicatrized, and the left cheek depressed near the border of the cavity.

"In May, 1863, a young man," says Dr. Wildman, "aged 26 years, presented himself for the purpose of having an appliance made to repair a loss sustained by disease. Upon removing the black patch which he wore upon his face, and the cotton with which the cavity was filled (without the latter he could not articulate a word), I found that the entire external nose was gone; that the nasal bones, the nasal processes of the superior maxillary, also a large portion of their palatine processes, the approximal parts of the palatine processes of the palatine and the turbinated bones had been destroyed. The soft palate, the uvula, and the tonsils were uninjured.

"In looking into the nasal cavity, the walls of the antrum on the left side were found deficient, and ends of the roots of the incisors exposed and decayed. The tongue was visible through the opening in the palatine arch. The size and shape of this orifice are represented by the outer central line in Fig. 115.

FIG. 115.—INTERNAL VIEW OF SUPERIOR ARCH.



"Although desirable, it was deemed unsafe to remove the diseased roots, owing to the yielding nature of the superior maxillary bones. The disease appeared to be arrested, and the parts in a sufficiently healthy condition to warrant the application of the substitute; and time has verified this, as, with the exception of the exfoliation of a

small scale from one of the superior maxillary bones, about nine months since, no change has taken place up to this date.

"The first step in the operation was to procure an impression that would enable me to make a perfect model of all the parts involved, and their surroundings, in their relative positions. For this purpose plaster was best adapted, but its use was precluded by the acrid secretions in the nasal cavity; wax and paraffin was considered the best substitute, and used. Owing to the rigidity of the upper lip, I was unable to use the ordinary impression cup with success, and was obliged to take a rough impression of the palatine arch, from which a model was made, and a metallic impression cup swaged.

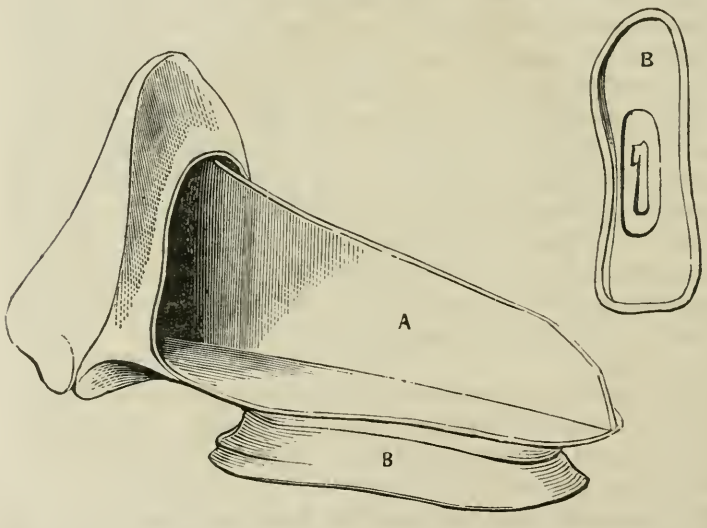
"A sufficient quantity of paraffin and wax was placed in warm water, and, with an assistant to keep it at the proper temperature, the mode of procedure was as follows: a proper quantity of the compound was placed in the cup, introduced into the mouth, and pressed up firmly against the arch; the part forced into the palatine fissure was at the same time pressed with the finger, introduced through the nasal cavity, so that it should give an accurate impression of its lateral borders. A groove was then cut in this to serve as a key, and, after oiling it, a piece of the compound was introduced through the orifice of the nasal cavity, and passed down to make the impression of the floor of the nasal cavity. When sufficiently hard it was carefully removed, the upper surface trimmed, placed in cold water to give it its greatest firmness, then introduced into the cavity, and pressed into its proper position. The metallic cup containing the impression of the palatine arch was then removed. The next step was to take an impression of the sides of the cavity, then the top, using a curved wooden spatula to press the compound in proper position, being careful to mark or key the parts that came in contact, and have their surfaces oiled, to prevent adhesion; and also that the pieces should be thinner in front than in their posterior parts, so that when the four pieces forming the impression of the base, sides, and top were in their proper position, they would leave a tapering cavity, with its largest diameter at the front orifice. Into this orifice was forced a plug or cone of the compound, filling it completely; in the front of this piece were inserted pieces of match sticks, to cause it to adhere to the next piece or mask. The head was now thrown back to nearly a horizontal position, wet tissue paper was placed over the eyebrows and lashes, the face oiled, and plaster mixed thick was batted on with a brush. When set, this was removed, drawing with

it the central plug or cone; the different parts were then carefully removed, and thrown into cold water to give them a consistency to bear handling without danger of injury. On this central cone all the parts were placed in their proper position, and the impression of the palatine arch was adjusted in its proper place. From this a plaster model was made, giving the upper part of the face, cavities, palatine arch, all correctly in their relative positions.

"Of the different substances—leather, wood, wax, metal enameled, and porcelain—used for making artificial noses, I gave the preference to hard rubber in this case, on account of its rigidity, strength, lightness, and less liability to injury by accident.

"To prevent derangement, it was necessary to make the appliance as simple as possible; it consisted of two pieces: the external nose, septum, and floor of the nasal cavity constituted one, having a projection passing downward into the palatine fissure, as represented in Figures 115 and 116, A; and the other, the obturator B, Fig. 117, with a projection rising upward into the palatine fissure. These

FIGS. 116 AND 117.—NOSE, WITH ATTACHMENTS.



projections were made hollow, so that when the two parts were placed together, as in Fig. 117, there would be a cavity or box wherein the attachments could be placed.

"Models were made of the compound of paraffin and wax, which

were strengthened in the weaker parts by imbedding small strips of metal in their substance to give sufficient firmness to admit of the necessary handling without injury. The model was applied to the patient, and the nose trimmed so as to harmonize with his features. They were then imbedded in plaster in the usual manner for vulcanite work, with the exception that a stout curved wire passed through the artificial nasal cavities, extending beyond their borders, to give strength to the rods of plaster forming these cavities in the matrix, and thus to prevent their fracture in packing.

"This appliance was vulcanized four hours, consuming one hour in attaining 280° F., at which point it was held one hour, and occupying the third hour in elevating the temperature to 320°, where it was retained one hour. The work was rather overdone, but not so much so as to injure it.

"The two pieces were retained in position by a staple and slide bolt. In the recess of the part of the floor of the nasal cavity projecting into the palatine fissure (A, Fig. 115) was inserted a gold staple. In the recess of the projection of the obturator passing into the palatine fissure (B, Fig. 117) were the gold catch and shield of the slide-bolt. The object of this shield was to prevent any foreign substance entering the slot and obstructing the movements of the bolt, also to give a base of support to the catch. The rectangular upright of the catch was soldered to the shield, passed through it and a longitudinal slot in B, and securely fastened to a rubber slide inlaid longitudinally, and moving freely in the lingual surface of the obturator. On the anterior end of this slide was a small rounded projection, which enabled the patient, when the two parts of the appliance were placed in their proper position, with the point of a finger introduced into the mouth, to force the slide backward, thereby to pass the catch into the staple and firmly secure the apparatus, or by drawing the slide forward, detach the parts when desirable to remove them.

"The external nose was painted with oil color, to give it as nearly a flesh tint as possible, although this is not attainable upon an opaque ground. Flesh being translucent, a true imitation can only be made upon a translucent ground.

"The apparatus was introduced on June 30th, 1863, giving to the patient great satisfaction and comfort. His appearance was much improved, as may be judged by comparing Figs. 114 and 118, which were engraved from photographs. He breathes freely through the nose, and speaks with ease; the only imperfection in his speech

is a nasal twang, and this is less now than when the instrument was first applied. The obturator at first extended too far back, and

Fig. 118.—The Face, with Nose.

caused some irritation of the velum; this defect was readily remedied.

"The operation proved entirely satisfactory, with two exceptions: first, the color of the nose was not as natural as desirable, for the reason already stated; second, in deglutition and speech, when the tongue pressed forcibly against the posterior part of the obturator, an unpleasant vibratory movement of the apex of the nose was noticeable. This could have been remedied by an elastic attachment coupling the two parts of the apparatus, but this mode was objectionable by reason of its producing constant pressure upon the delicate parts, and thereby endangering absorption. A safer plan was adopted by inserting a small steel pin in the nose as near as possible to its apex, to which was attached the bridge of a pair of spectacle frames, these being retained in position by an elastic cord attached to the bows and passing around the head. This arrangement answered the double purpose of counteracting the vibratory

movement, and the bridge of the frames concealing the upper part of the joint where the nose came in contact with the face, which was most conspicuous.

"This apparatus is worn with ease and comfort by the patient."

The obturator, although employed by the ancient Greeks, and by every succeeding generation of civilized men, seems to have attained to its wonderful completeness only in our own age. Before the time of Ambrose Paré, the appliances were all of a temporary nature, if we except mention of one suggested by Petronius, in the sixteenth century, although whether this surgeon ever really made such a plate as he described, we are not informed. To Paré, however, we are indebted for a written description of the metal obturator, crude, without doubt, but embracing the principles of the present instruments. "Made," says this surgeon, "like unto a dish in figure, and on the upper surface, which shall be toward the hair, a little sponge must be fastened, which, when it is moistened with the moisture distilling from the brain, will become swollen and puffed, so that it will fill the concavity of the palate, that the artificial palate cannot fall down, but stand fast and firm as if it stood of itself."

Garangeot, in 1715, makes an advance on the idea of Paré—although, it must be admitted, a very slight one. He describes his instrument as having a stem in the form of a screw, upon which ran a nut. To make use of it, he cut a piece of sponge in the form of a hemisphere, with a flat surface; through this sponge the stem was passed, the nut holding it in place. When about to introduce it, he wet the sponge, then squeezed it dry, and forced it through the aperture or break.

After the period of Garangeot, no special advances seem to have been made until 1828, when obturators were constructed by a Mr. Snell, prepared on casts, which were correct representations or impressions of the special cases. In a monograph published by this writer, he says: "My method of constructing an obturator is with a gold plate, accurately fitted to the roof of the mouth, extending backward to the os palati, or extremity of the hard palate; a part of the plate, about an inch in length, being carried through the fissure. To that part of the plate which answers to the nasal fossæ are soldered two plates, meeting in the center and carried upward through the fissure to the top of the remaining portion of the bones, to which it should be exactly adapted, and made to the natural shape of the

nasal palatine floor; thus the fluids of the mouth will be carried backward into the fauces. A piece of prepared elastic gum is next attached to the posterior part of the plate where the natural soft palate commences, extending downward on each side as low as the remaining part of the uvula, and grooved at its lateral edges to receive the fissured portions of the velum; a movable velum is placed in the posterior center of the elastic gum. That these may partake of the natural movements of the parts during deglutition, a sponge is affixed behind them, one end of which is attached to the posterior and anterior surfaces of the principal plate, and the other end rests gently against the posterior face of the india-rubber: this keeps it always in close apposition with the edges of the fissure during deglutition.

"It is requisite to mention," he says, "that the elastic gum should be placed in a gold frame, and not merely fastened to the posterior part of the plate, as it would shrink up by remaining in the mouth. This frame should pass round its edges only, leaving the center upon, etc."

In 1845, Mr. Stearn, a surgeon of London, conceived the idea of an obturator, the principle of which has been brought to such perfection by Dr. Norman W. Kingsley, of the Dental College of New York.* This appliance, as made by Mr. Stearn, consisted of a gold plate fitted to the hard palate, having attached to it, by means of two spiral springs, an artificial velum of elastic rubber, consisting of a body, wings, and grooved edges, to receive the margins of the cleft. The conception of this obturator reflects the greatest praise upon Mr. Stearn, an honor which Dr. Kingsley may feel it no detraction to share with him.

The perfected instrument of Dr. Kingsley, though greatly differing from that of Mr. Stearn, consists likewise of a body with movable wings. These wings, made of soft rubber, fill up the break in the soft palate, being moved by the lateral remnants of the defective parts.

With respect to this obturator, so much experience seems to have accumulated that its great usefulness can no longer be doubted.

Concerning the mode of manufacture, taking the impressions, and applying the piece, full details can be found in Harris's Principles and Practice of Dental Surgery, edition of 1863.

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* Dupuytren, the eminent French surgeon, is not, as it seems to me, without some claim to a share in this invention; his idea, however, was very crude.

CHAPTER XLII.

RESECTIONS OF THE MAXILLARY BONES.

The history of experimental surgery upon the bones of the face furnishes one of the most interesting of the chapters in surgery. The formation upon and within these bones of such diseases as seemed to make desirable their removal, necessarily directed, from a comparatively early period, the attention of surgeons to the feasibility, propriety, and promises of such operations.

It is not at all unreasonable to infer that surgery gained its first lesson in this direction by observing, through the results of accidents, how extensive could be an injury done to these parts without fatal, or, indeed, even threatening consequences. Hence, as early as 1693, Acoluthus, a surgeon of Breslau, attempted the removal of a portion of the upper jaw for a tumor, in which operation he succeeded very satisfactorily. Jourdan, according to his translator, removed, at various times during his century, portions of the jaw. To Dr. Jameson, an American surgeon, however, most are agreed, belongs the credit of having made the first complete resection or removal of the upper jaw,—this having been done in 1820. Prof. Gross gives the credit to Lizars, of Edinburgh, believing him entitled to the merit of having first suggested the possibility and advantage of the operation. In 1824, four years later, Dr. David Rodgers, of New York, resected both superior maxillæ. Afterward this was attempted by Lizars, and in the same year by Gensoul, of France. After this the operations may be esteemed as having become commonly recognized, surgeons of ability performing the various sections throughout England and France, and especially in the United States.

While the operation of resection has been frequently performed, it cannot but surprise the surgeon of to-day to notice how slowly its lessons were learned. At present it is practiced with little preliminary caution, being esteemed an operation that may be performed with really little danger to the patient, and even without much damage to the appearance. Formerly, and, indeed, not very

far back, it was considered only safe to ligate, as a preliminary step, the primitive carotid artery; and when, as experience advanced, this was seen not to be a necessity, the actual cauterants were always held in readiness, a practice which, much to the detriment of a happy cure, obtains in some sections even to the present day.

Resections of the maxillary bones are practiced for various diseases, the principal of which are the malignant tumors. That such resections are so often reported as unfavorable, has not been from shock, or any local injury done, but from the fact that the disease for which the operation was performed was in itself fatal.

"Excision of the upper jaw," says Mr. Syme, "when performed for the removal of tumors which are confined to that bone, is a most satisfactory and successful operation; but if the operation be attempted for the removal of a disease which has originated in the base of the skull, and grown downward, it not only, as is well known, fails in its object, but speedily ends in a fatal result. In diagnosing between a tumor of the upper jaw which admits of removal and one that does not, Mr. Syme directs special attention to the appearance of the face. If the eyeball be displaced, and the position of the bones of the nose be altered, the case is one which does not admit of operative measures; but if these signs are absent, and if the history of the case shows that the disease began in the jaw itself, then the disease will most likely admit of complete cure by the excision of the affected bone. The soft nature of some of these tumors is no hinderance to the performance of the operation, for Mr. Syme has excised the upper jaw with a good result in many cases, where the consistence of the tumor was quite as soft as that of a malignant growth."

In looking, after an interval of months, and, in a few cases, of years, at individuals upon whose jaws I have personally performed resections, I have been astonished at the correction on the part of nature of deformity. The little German boy, alluded to in the chapter on Necrosis as having lost the left half of the inferior maxilla, without at the time any reproduction, looks to-day as though no such loss had ever occurred; his face is exactly as it was before the operation, and, as far as I can see, the ability to masticate, allowing for the loss of the teeth on that side, is about as good as ever. This, however, is an uncommon case, the result without doubt of the youth of the patient.

Ollier, by his experiments upon the osteogenetic properties of the periosteum, has done good service to oral surgery. It is now a

common practice in all resections to spare and save all the tissue possible. I have, in the chapter on Necrosis, spoken of my own success in this direction, having replaced entirely, with the exception of the alveolar process and teeth, the whole of the body of the lower jaw through the process of enucleation.

It is not to be forgotten, however, that the seeds of a disease, so to speak, may be left in a part by an attempted preservation of periosteal tissue. This fact is always, in all classes of resection, to be borne prominently in mind: periosteal tissue is not to be saved unless healthy.

To make a complete resection of either maxilla implies, ordinarily, a preliminary uncovering of the affected bone. The incisions to such ends are necessarily various, being influenced by the condition of the parts beneath. They are not, however, always necessary. Prof. Horner, as exhibited in Plate XIII., has removed the upper jaw of the left side without preliminary incision; and in two favorable cases I have myself succeeded, without the slightest difficulty, in doing the same thing.

In the case of tumors of magnitude and importance, these subintegumental operations, in my opinion, are not to be commended. A wound, or incision, made to expose such tumors, may be united by the first intention, leaving little or no scar, while certainly the exposure obtained through such incisions compensates by the liberty and rapidity of movement allowed in the subsequent steps of an operation.

Subfig. 1 exhibits the mouth of the patient of the late Dr. Horner, immediately after the removal of the superior maxillary bone without external incision; Fig. 2 is a side view of the bone removed; and Fig. 3 is the likeness of the patient taken three years after the operation. The operation, as practiced by Dr. Horner, is thus described by his son-in-law, Prof. Smith: "Having determined to avoid cutting through the cheek, as commonly practiced, the patient was seated in a chair, with his head well supported, and partially etherized. The assistant, supporting the patient's head, then raised the angle of the mouth on the left side,* and held it widely open, while the upper lip and cheek were dissected from the superior maxilla as far back as possible, in a line parallel with the superior margin of the buccinator muscle. The two incisor teeth on the left side being then drawn, the corresponding alveoli were cut through in the middle

* The figure, by an error, is made to show the operation on the right side.

line by a narrow saw, which worked its way from the mouth into the left nostril; then a pair of strong hawk-bill scissors, such as are used by gardeners for lopping off twigs, took out the two vacated alveoli at a clip.

"A thin, flat, well-tempered knife, with a strong, round handle, was now struck through the roof of the mouth into the nose, at the junction of the palatine processes of the palate and superior maxillary bones (posterior middle palate suture), so as to cut forward and separate the maxillary bones from each other in the middle, when the narrow saw was again used to cut through the root of the nasal process of the maxillary bone, and strong scissors, curved on the flat, made to cut through the orbitar plate at its margin, the incision being carried back to the pterygoid process of the sphenoid, around and below the malar bone.

"The base of the soft palate being then detached by a short, triangular knife, curved on the flat, so as to leave the soft palate attached to the palate-bone, a few touches of the knife freed the remaining attachments.

"The pterygoid process, malar bone, and the orbitar plate of the upper maxillary were not disturbed. The tumor,—which was scirrhous,—besides its bony connection, was also attached to the posterior part of the cheek, and to the external pterygoid muscle. The gouge and scissors, however, sufficed to remove every part that could be detached.

"The bleeding was profuse, especially from what was believed to be the posterior palatine artery, but the vessel was readily secured by means of a ligature and Physick's needle, and a few other ligatures, with charpie, arrested the remainder of the hemorrhage."

The ordinary operation for the removal of the superior maxillary bone I may now proceed to describe in detail.

If the disease for which such an operation is to be performed is a tumor of moderate dimensions, say scirrhus, as in Prof. Horner's case, —which seldom attain to large size,—the uncovering of the part is to be effected by dividing the superior lip in the middle line, carrying the incision upward along the base of the ala of the diseased side to the inner canthus; the flap thus secured, which is triangular, is dissected off as far as possible. Now remove the central teeth, and, with a scalpel, make an incision along the middle line of the hard palate as far back as the palato-maxillary articulation; at right angles with this incision make a second, extending to the tuberosity of the maxilla, the cut to be as nearly as possible on the line of the

articulation. Examining at this stage a skull,—which it is never amiss to have by,—take up a Hey's saw, and cut across the nasal process, leaving, if possible, the orbital plate. Next, with the same saw, cut across the maxillo-malar articulation; this completes the two upper sections. The third, the intermaxillary, is quickly effected by introducing within the nostril one blade of the large cutting forceps, the other being placed on the line of the articulation within the mouth, as far back as the point of union with the palate-bone; the incision is now made, and the separation, so far as cutting is concerned, is completed. Take now a pair of strong forceps, and, seizing the bone, twist it from its bed.

The hemorrhage, the matter next demanding attention, varies very much with circumstances. It may be that twenty arteries will jet their blood into the face of the operator, or, on the contrary, only two or three may require artificial means for their control. One need neither be hasty nor timid about this bleeding. Water, fully saturated with alum, simply squeezed into the cavity from a sponge, will oftentimes control it. If this should not answer the purpose, a syringe may be used, throwing the water against the vessels from some little distance. The casting of a ligature around a vessel is, however, a matter as easy as it is simple. Wash away the blood until the orifice of the bleeding artery can be seen, catch it with the tenaculum, or forceps, draw it thus a little from its sheath, and tie it. Repeat this with each vessel until all are secured.

That proper form and support may be given to the integuments, the next step in the operation is the stuffing of the wound. To do this, take a number of pieces of old linen, or patent lint, fold them into small squares, saturate these freely with alum-water, and, one by one, pack them into the cavity until the contour of the part shall correspond with that of the other side. The surgeon is to remember how many of these squares he has used, that thus he may have the assurance at a future period that all have been removed.

Rotundity and form secured, the flap is next laid carefully into place, and closely, yet not tightly, approximated by a sufficient number of stitches of the interrupted suture. It is generally the best plan to put a pin or stitch first in the lip, thus insuring correct approximation at this most important point.

As a dressing, simple cold water may be used, keeping the parts constantly cool by its continuous renewal; or, if water alone is found insufficient to control vascular excitement, it may be medicated with lead in the proportion of ℥ij to ℥xvi; cold water, however, will generally be found all-sufficient.

Concerning the pads or squares inside, I am confident it will be found the very best practice never to allow them to dry from the time of their first introduction. This is easily prevented by repeated syringing with pure water, or water medicated with stimulants, astringents, sedatives, or antiphlogistics, as indicated.

The stitches used in approximating the external wound are to be removed as soon as possible,—three or four days will generally allow of such removal. It is well to remove them gradually, taking away intermediate ones.

The removal of the squares is to be effected leisurely—indeed, the principle is to consider them as a tent, to be thrown out as the wound granulates and fills up below them; pick out the top or middle ones, as the irritation produced by their overretention compels you. Or, if it seems necessary, after the first three days have passed, they may all be removed and renewed, in lessening numbers, daily.

This completes the surgical proceedings of such a resection.

Many cases, however, occur where the external incision here suggested might not be the best one, and, indeed, where it might not be sufficient to uncover the disease. Certain surgeons prefer to expose the bone by an incision, commencing at the angle of the mouth, and passing obliquely upward over the Stenonian duct to the center of the malar bone, throwing thus the flap upward and inward from below. Another favorite mode is to use both these incisions upon the same subject, a necessary proceeding, in many cases, where the tumor is large.

"Mr. Fergusson, who is particularly successful in oral surgery, in remarks after an operation for the removal of disease affecting the alveolus and antrum, made some important and interesting observations, having reference generally to the exposure of such parts prior to the removal of the actual disease. He said that formerly, and even now, some surgeons were in the habit of freely dividing the integument of the cheek, lip, etc., trying to get at the disease from various points. Mr. Fergusson said that one method he pursued with advantage (as in a case of removal of malignant disease of the upper jaw), was to divide the upper lip in the median line, and then by carrying the incision on one or both sides, as the circumstances of the case required it, into the nose, to dissect back the upper lip, ala nasi, and cheek, and thus expose the parts freely, avoid the deformity of scar on the cheek, or, to use his words, 'to leave as few marks of the surgeon's doings on the face as possible.'

In a case then before him—a young woman—he was able to remove the disease without interfering with the lip. It affected the alveolar ridge of the right side, extending from the second incisor to the second molar, and was continued into the antrum; but whether it first arose in the antrum or the alveolus, he did not know. Mr. Fergusson attributed the success attending this method of removal, in a great measure, to the instrument he used, viz., a pair of clipping forceps. He first clipped away the alveolar ridge, and then attacked the portion of disease situated in the neighborhood; by this means freely laid open the antrum and nostril. He alluded to a case in which Mr. Bowman successfully removed a large tumor from the antrum extending into the mouth, without dividing the lips."

Such a mode of uncovering a tumor of limited size is admirable: the section will be found to make a large exposure, and the scar left will scarcely be remarked.

Operation for Resection of both Superior Maxillæ.—It has never fallen to my lot to resect, or to see resected, both maxillary bones. Several such operations are, however, on record; and from them I select that of Heyfelder, as being the one I myself should perform should such a necessity arise.

The patient is to be seated in a chair, with his head supported by an assistant, or, better, he may lie down. An incision is made on each side of the face, from the external angle of the eye to the labial commissure; the included parts are now reflected upward toward the forehead until the infraorbital ridges are exposed. This uncovers the whole of both bones. The chain saw is now passed through the spheno-maxillary fissures, the malar bones are divided, the maxillæ separated from the ossa nasi, and the vomer and thinner bones are cut with strong scissors. These steps complete the separation, when the bones are to be pried from the cavities with elevators or twisted away with the lion forceps of Liston. The result of an operation thus performed by Heyfelder is thus described: "Very little blood was lost, torsion and compression sufficing to arrest the hemorrhage. Two hours afterward, the edges of the wounds, from the angles of the eyes to the corners of the mouth, being united by twenty-six stitches of the interrupted suture, cold lotions were applied: there was no reaction or swelling, and the patient could swallow water and broth. Four days subsequently, the wounds had nearly healed by the first intention, and in six weeks the patient was exhibited to the Medical Society of Erlachen. At this time there was no deformity of the features: a fissure, thirteen

lines long and three lines wide, was seen along the median line of his mouth; the soft palate and uvula were in their natural place; deglutition was free; the nose had resumed its original form and direction; and the face, which, before the operation, was like that of a monkey, again possessed a human expression; a firm and solid tissue replaced the extirpated parts."

Professor Gross, while commending that any operation for the removal of the upper jaw should be preceded by a careful inquiry into the history of the case, is not, from his experience, inclined to admit that encephalomatous tumors are to be esteemed as always hopeless to operative interference. "If the tumor," says this gentleman, "be large in size, rapid in its development, dipping into the surrounding structures, and attended with contamination of the neighboring absorbent glands, failure of the general health, and a sallow, cadaverous countenance, all manual interference is out of the question. On the other hand, however, there is no reason, in my opinion, for refraining from the use of the knife, even in this form of disease, provided the morbid growth is comparatively small and tardy in its progress, and the surrounding parts and constitution are perfectly sound." Professor Gross thinks the propriety of such a course is sanctioned by the experience of the best surgeons.

Concerning hemorrhage, this same gentleman gives it as his experience that there are no organs in the body of the same extent in their natural and diseased conditions, the removal of which is attended with less trouble in this direction. "I rarely, if ever," he says, "stop to tie a vessel during any operation, however extensive or complicated." My experience has taught me that there is, in general, no necessity for such a course, which is always attended with vexation and delay. The deep-seated arteries involved in tumors of the upper jaw seldom bleed much, if care be taken to keep beyond the limits of the diseased structures. If this precaution be neglected, the hemorrhage may be copious and even exhausting.

Resections of the Inferior Maxilla—in whole and in part. —Partial resections of the lower jaw have become so common as to elicit little attention. I have myself certainly made such sections in as many as fifty cases. The causes necessitating such operations are considered in other parts of this work. (See Chapters on *Tumors.*)

Subfigures 6, 7, and 8, Plate XIII., exhibit various steps in such resection, and are photographically true, allowing for the absence of the blood.

Complete section of the lower jaw is one of the most disfiguring and comfort-destroying operations that can be practiced on the living being, and is never to be performed without the existence of a well-recognized or proven necessity. Any partial section anterior to the rami may generally be easily accomplished without external wound, the lips being held out of the way by the mouth-stretcher used in the performance of dental operations.

FIG. 119.—MOUTH-STRETCHER APPLIED.

In cases where section of the lip may be thought desirable, as when the practitioner, from inexperience, may not be able to accomplish the section without the exposure, various cuts are proposed and required. These cuts may be fully understood by the studies presented. Subfigure 8, Plate XIII., represents exposure of the mental portion of the bone. The flaps, 1, 2, are made by a single vertical incision through the median line of the lower lip, crossed by a

second at right angles at the base of the jaw, extending on either side, laterally, as far as the bone is required to be removed.

Subfigure 7 represents the exposure of the whole left half of the jaw. To accomplish this, make a first incision in the median line to the under border of the bone. From this carry a second under the jaw—although along it—to the temporo-maxillary articulation. Dissect now the flap upward. In the horizontal cut here made it will be perceived that the facial artery is divided; this is a large vessel, and requires a ligature. It will be found, I think, the better practice to tie both ends before proceeding to the operation upon the bone. The coronary artery cut in the vertical incision will often compel a ligature.

Subfigure 6 exhibits an exposure of the whole body of the bone. This is accomplished, as in the drawing, by a simple horizontal incision along the base of the jaw, carried from angle to angle, and the flap, including the mouth entire, thrown up; or it may be secured by joining the horizontal to a vertical incision made from the angle of the mouth; or, as in Fig. 8, by the median, vertical, and horizontal incisions. These sections understood, any required modification will suggest itself.

Subfigures 4, 5, 6, represent an operation practiced by Dr. J. Rhea Barton: 4 exhibits the tumor, which will be seen to be of great bulk, being described as having complete possession of the mouth, forcing the tongue into the pharynx, and stretching the jaws widely apart. It also rose up outside the superior maxillary bone, protruding the lips, cheek, and neck on the left side.

Finding, by examination, that the base of the bone might be left with promise, Dr. Barton made the resection as exhibited by the lines in 5. This was accomplished by sawing horizontally from without inward, commencing at the middle line below the canal, and extending the section bilaterally. The removal of the bone, in this particular operation, gave no hemorrhage requiring attention. The flaps being replaced and stitched, the patient was well in a month.

Complete section of the jaw, as exhibited in Fig. 8, after the practice of Dupuytren and many successors, destroys forever the articulation of the jaws, and interferes not only with mastication, but seriously with deglutition and speech. Exposing the bone as directed, the section is most easily made with either the Hey, metacarpal, or chain saw. Before, however, shaving the bone from its inner attachments, a loop of waxed silk, or silver wire, is to be passed through

the tip of the tongue, that it may thus be prevented from being drawn back into the pharynx by the genio-hyoid and stylo-hyoid muscles.

Subfigure 7 exhibits the removal of one-half the maxilla. Exposing the bone as directed, remove one or more of the center teeth; next, from without inward, saw through the bone, or, if preferred, use the chain saw, carrying it around the bone by the aid of a curved needle. Catching now the bone in the grasp of the forceps, or using the fingers, as preferred, detach the inner soft parts, twisting the bone outward and downward. Arriving, in the dissection, at the coronoid process, the temporal tendon is to be detached by a chisel-shaped knife, care being taken not to wound the maxillary artery or internal carotid. This process freed, the condyle can be twisted from its ligaments, or, better still, twisted and cut away. This operation, apparently so formidable, I once succeeded in doing without external incision. With the section as represented in the figure, it is not at all difficult. A diseased bone is not, I am convinced, nearly so difficult to disarticulate as the sound one.

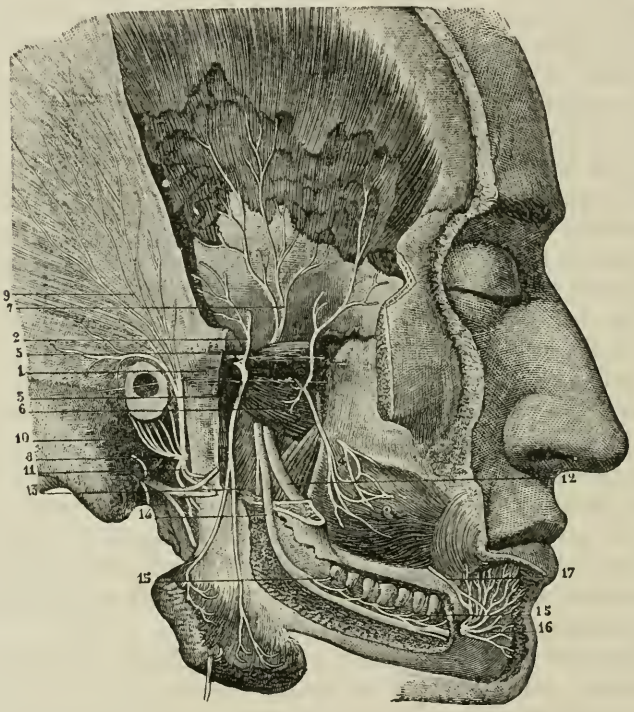
Prof. Smith, in his System of Surgery, gives the credit to Dr. Geo. McClellan of having been the first to attempt more than a limited section of this bone,—this surgeon, in 1823, removing all the parts anterior to the angles. In this, however, he was preceded by Deaderick, of Tennessee, who, in 1812, made a resection which extended from the symphysis to the angle. Mott, of New York, is also referred to as having made an operation similar to Deaderick's, in 1821. Dr. Ackley, of Cleveland, Ohio, is reported as having, in 1850, removed the bone entire. In Europe, priority of the operation performed first by Deaderick is awarded to Dupuytren. Mott, according to Prof. Smith, disarticulated the bone,—Deaderick and Dupuytren did not. Prof. Mott thought it necessary to ligate the primitive carotid artery a few days before making his resection, a step long since proved to be entirely uncalled for, complicating and increasing the dangers of the operation.

The operation of Dr. Deaderick, deservedly famous for its priority, was done on the person of a lad fourteen years of age. The operation was performed for the removal of a cartilaginous tumor on the left side of the jaw, filling up nearly the whole of the mouth, causing the greatest difficulty in swallowing, and, at times, even in breathing. To accomplish his resection, Dr. Deaderick commenced an incision under the zygomatic process, and carried it across the tumor, downward and forward, to nearly an inch beyond the middle of the chin. From the center of this first incision, and consequently at right angles with

it, an incision was extended a short distance upon the neck. The flaps thus secured were dissected from the diseased mass, and the bone next sawed off at the angle and symphysis. The flaps were now laid back in the usual way, and the boy made a speedy recovery.

Nerve Section.—A most interesting department of resective surgery—for thus it may be termed—is found in the operations required to expose nerves involved in neuralgic lesions. It is certainly no longer a question that sections of nerve-cords may be made without special danger or risk,—the greater question being always the estab-

FIG. 120.



lishment of a correct diagnosis. In the chapter on Neuralgia I took occasion to remark that such operations were far from being satisfactory; but that remark is here to be modified by pronouncing the fault, in many of the cases, to be rather with the surgeon than his case. Section of a nerve is only justified where on the peripheral side there exists a lesion which may not otherwise be cured; and of such cases there are, without doubt, many.

Section of Inferior Maxillary Nerve.—While I am very well convinced that in many of the reported cases sections of the inferior maxillary nerve have been made without necessity, yet it is certainly an operation to be practiced and commended.

In looking at Fig. 120, the nerve, which is a cord of some size, is seen to pass within the substance of the jaw midway to the thickness, and on a line which would be well enough marked by taking the center between the base of the bone and the cutting edges of the teeth. Approaching the ramus, it ascends obliquely upward and backward, escaping operative proceeding at the posterior dental foramen.

To expose this nerve, if within the ramus, begin an incision at the sigmoid notch, and carry it carefully downward through the integuments, avoiding with all care the wounding of any overlying part of the parotid gland; the gland discovered, push it carefully backward, and complete the incision down to the bone, scraping aside, rather than removing, the periosteum. As the next step, take a small trephine, and cut out two sections, or rather cut, with the trephine, sufficiently deep to reach, or very nearly reach, the nerve canal. Take now the chisel, and with gentle cuts remove the intervening portion of bone. If the operation is carefully performed, the nerve can be uncovered without the slightest wound. Reaching the vessels, isolate the nerve from the artery and vein by lifting it upon the tenaculum. It is now to be divided, removing as much as is thought desirable, never less than half an inch, and if more, certainly the better.

If the operation is to be performed within the body proper of the bone, the uncovering is even more simple: use still the straight line, cutting midway upon the bone, separate the lips of the wound by delicate retractors, securing a free exposure of the bone (with the periosteum scraped away, as before suggested), trephine, and remove the section.

The facial artery, it is not to be forgotten, passes in front of the masseter muscle; if it is necessarily cut, the operator must stop and throw a ligature about it,—it is better to tie both ends. Cuts into the muscular substance are to be avoided as much as possible; such incisions add to the trouble of an operation by the free hemorrhage provoked.

A section of the nerve cord secured, the surgeon carefully lays back the flaps and watches the result. It has been thought well by some to give large doses of some opiate immediately after such

operations; but when this is required I infer the operation will be found to prove a mistake, as in such successful cases as have occurred in my own experience, the relief from suffering experienced has acted as the profoundest of opiates,—the patients sleeping for the first few days almost continually.

Among the recorded cases of section of the inferior dental nerve where complete success has attended the operation, are four by Prof. Gross. In these cases all known remedies for the relief of the disease had been employed without avail.

Inversion and Eversion of Lip.—It sometimes happens that from accident or congenital defect the lip—generally the lower—is inverted or everted. When turned inward, the part is shortened, and not unfrequently permits of the escape of the oral fluids. Inversion, while generally the result of some cancroid affection which has produced considerable cicatricial tissue, is yet occasionally observed associated with some perversion of the frænum, this fold being undnly short, or running too near the free edge of the lip. A case of inversion, the worst I have ever met with, resulted from a gunshot wound, involving both lip and jaw. In this case that surface which was the free edge had become involved in reparative material near the base of the alveolar process, and had thus become tightly bound to these parts; the teeth and face of the gums being exposed. To prevent the dribblings from his mouth passing to the neck and breast, the patient had constructed for himself a species of tin cup, which he constantly wore bound to his chin, and which was concealed from observation by a large neckkerchief.

Eversion, the more common condition, depends, like inversion, on a variety of causes. A burn received about the chin, contracting the part, has frequently produced it. Hypertrophy of the mucous membrane is an occasional cause; preternatural elongation of the frænum permits such falling outward. Any loss of substance externally, contracting the parts, necessarily tends to eversion.

Treatment of inversion or eversion varies, of course, with the various causes. In the inversion of the lip where such cause lies in the existence of cicatricial tissue, it will be found easier to imagine than to secure the means of cure. If the lip has length, a cure may be attempted by an elliptical portion taken from the outer surface, the parts being brought together and an immediate union secured through the use of the hare-lip pin or common interrupted suture; if, on the contrary, the lip has been shortened in its bulk, as is frequently the case where the ulcer has been deep, we must depend for

relief on a plastic operation: such an operation consists in cutting away the cicatrix and transplanting to the seat of removal a pediceled flap taken from the inner face of the cheek; this, however, is always more or less unsatisfactory, such inversion being the worst form to treat.

A shortened or improperly attached frænum is, generally, most easy of correction,—a section, more or less extensive, assisted by a frequent turning outward of the parts by the patient, quickly resulting in the cure.

Inversion from gunshot injuries classifies itself with contraction from ulceration; each case is a study in itself, and will be found to have its own peculiar demands. Many of these conditions have no cure, the patient being doomed to drag through an undesirable existence. Others will be found very easy of remedy, some attached point requiring, perhaps, alone to be freed. An intermediate class, and this is by far the most common, demands a combination of operations,—such requirements suggesting themselves to the ingenious surgeon.

Eversions are treated on the same general principles. An ellipsis from the mucous face of the lip is the most common mode of cure resorted to. A second mode is a double V-shaped incision, the center of the cut being the center of the lip; the space within, being wider than that without, naturally draws the parts inward and downward. In preternatural elongation of the frænum I have secured satisfactory results by cutting out a limited portion of the bridle and producing an eschar by the use of nitrate of silver. Or, if the operator prefer, he may stitch the parts together after the abbreviation, securing the continuance of an approximation by the use of a turn or two of a bandage.

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